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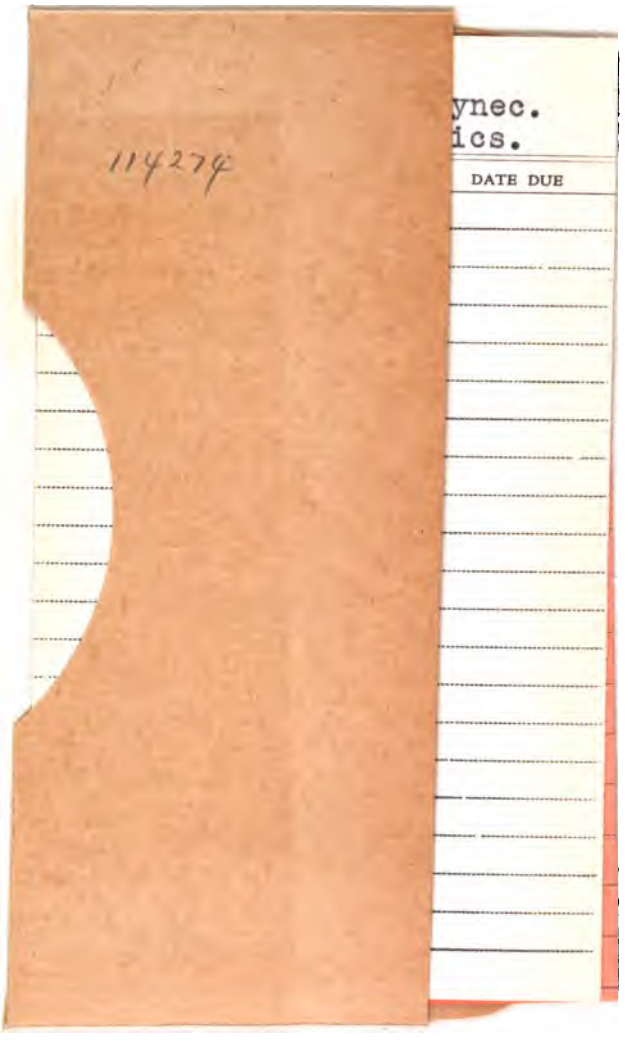

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Studies In

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By

ELLICE McDONALD, M. D.

New York City

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STUDIES IN GYNECOLOGY AND OBSTETRICS.

BY

ELLICE McDONALD, M. D.,

New York City.

CHAPTER I.

STERILITY IN THE FEMALE; ITS ETIOLOGY AND TREATMENT, WITH REPORT OF A CASE OF INSTRUMENTAL IMPREGNATION.

General Considerations.—The most vital instinct is embodied in the question of child bearing and sterility. The unhappiness and longing of some sterile women no male mind can fathom. The unsatisfied maternal instinct is a misdirected, unnatural expression of a strong inherent force. This instinct is at best the most vitally unselfish of all desires and emotions with which nature has endowed the human race. Few women are voluntarily sterile, and no woman exists whom at some time in her life did not wish for a child.

For these reasons sterility is in women the most pathetic and touching of all the ails that feminine flesh is heir to. The amount of our knowledge of its causes and of the processes of reproduction up to a few years ago have been ridiculously small: but more recent investigation begins to throw some light upon the subject.

The average interval between marriage and the birth of the first child is seventeen months, and the probability of impregnation decreases thereafter. Only twenty-five percent. of women bear their first child after four years. A union may be regarded as presumptively sterile when after three years of married life no child has resulted. Norris thinks that this time should be reduced, and that a union should be regarded as sterile if no child has resulted within two years after marriage. It may be that the truth is midway between the two opinions.

Etiology.— Of the various causes of sterility in women, the chief cause of the large majority of cases is lack of development of the genitalia. This usually takes the form of the infantile uterus and the mal-development may involve the vagina and external vulvar parts. Hypoplasia and arrested development are the usual forms and it is frequently hereditary.

This infantilism may exist in varying degrees. It may be associated with other evidence of congenital hypoplasia, *asthenia congenitalis,* or it may exist alone in the uterus.

When there are other evidences of infantilism, it is commonly associated with right floating kidney, masculine pelvis, long back, cannon ball abdomen, intestinal ptosis, proportionately small head, weak ligaments, high-roofed mouths, lobeless ears and other evidences of physical degeneration in women under weight and with unstable nervous systems. With these associations, the infantile uterus, undeveloped vulvar parts and constricted vagina are almost always present. This type of woman begins to menstruate late in life, and ceases early. Their menstruation like the rest of their functions is subnormal, small in amount, and short in duration. The premature menopause of cessation of the menstruation, between 28 and 38 years of age, is not infrequent with this type.

While this is the extreme type of infantilism or hypoplasia or asthenia con-

genitalis, it is common to find all degrees and minor evidences of infantilism existing alone. In the genitalia, the infantilism is often confined alone to the vulva and vagina or vagina cervix or uterus alone.

When the uterus is infantile, it retains the shape and appearance of the uterus of the girl before puberty. It may take one of two types. It may be long and slender with a small fundus, a long isthmus and a long conical cervix, or it may be shorter with a long isthmus, small fundus, and a small cervix with most of the cervix being placed above the insertion of the vagina, and a little projecting. The first type usually has a marked anteflexion and the second type is frequently associated with a vagina markedly narrowed in its upper part.

is of great value in making the diagnosis. The chief change is in lack of development of the labia minora. The labia majora are also small, the clitoris is undeveloped and the whole vulva gives the impression of lack of development and nutrition.

This genital infantilism seems to occur in planes, one of which is the fundus of the uterus; the second, the cervix and upper part of the vagina, and the third the lower part of the vagina and external genitals. Any one of these planes may have lack of development alone, although it is more common to find two planes associated. It is possible that when one is infantile the others are also although our methods of examination cannot detect it.

Genital infantilism is the cause of al-

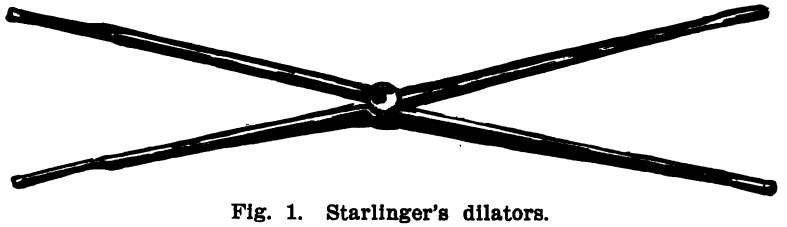

Fig. 1. Starlinger's dilators.

The infantile uterus usually has a long isthmus with the plicae palmatae of the mucosa of the isthmus well marked and longitudinal instead of being thin and horizontal or twisted.

The vagina is commonly involved in the infantilism of the uterus, and this takes the form of a narrowing, particularly of the upper part or vaginal lake, so that instead of being balloon or pear-shaped with the largest end upwards, the vagina is tubular or sausage shape. As a result of this, the semen is not retained where it should be after coitus.

The vulva may be also involved in the infantilism and it is here that inspection

most all the cases of sterility in women. Of course, there are many other isolated causes, such as ovarian disease, tubal disease, misplacement, perineal lacerations, lactation, thyroid disease, diabetes, tertiary syphilis, uterine tumors, imperforate hymen, vaginismus, etc., but these are only occasional in their occurrence while sterility is a common association of genital mal-development and mal-development is the chief cause of by far the great majority of cases of sterility. It is essentially lack of function from incompetence and unfitness.

One effect of the infantilism in the vagina is that the semen cannot readily be

retained, as it should be in the contracted vagina. Fruitful normal women retain the semen while sterile women commonly lose it. Runge has shown that thirty-two hours after coitus there was spermatozoa in three-quarters of all fruitful women while only one-fifth of the sterile women had spermatozoa in the vagina. At the end of thirty-six hours, the proportion was two-thirds of the fruitful and only an occasional sterile woman had spermatozoa remaining.

The infantilism is not unlike that atrophy of the uterus which sometimes comes during lactation. The best treatment for infantilism is pregnancy which increases the blood supply and development and wards off many of the evil symptoms of infantilism of the genitalia, known symptomatically as the premature menopause, neurasthenia gastroptosis, etc. It is for this reason that patients in this condition should be encouraged to undergo treatment for sterility.

The majority of cases of sterility are caused by infantilism of the genitalia. Other causes as before mentioned are occasional; but this is constant. It is not believed that endometritis or alteration in the vaginal or uterine discharges play much part in the production of sterility. I have seen two cases in which membraneous endometritis seemed to be a factor; but they were the only ones I have ever seen in which endometritis influenced the condition. Chronic endometritis is a rare disease. Chronic endocervicitis, which is usually meant when endometritis is spoken of, is a common form of gonococcus infection. It occasionally causes sterility; but not often, as is proved by the report of maternity clinics. Gonococcus salpingitis is a more common cause of sterility although cases of pregnancy have been reported where there were pus tubes on both sides. These causes are by no means frequent, and I do not believe that the gonococcus is responsible for nearly as many cases of sterility in women as are commonly ascribed to it.

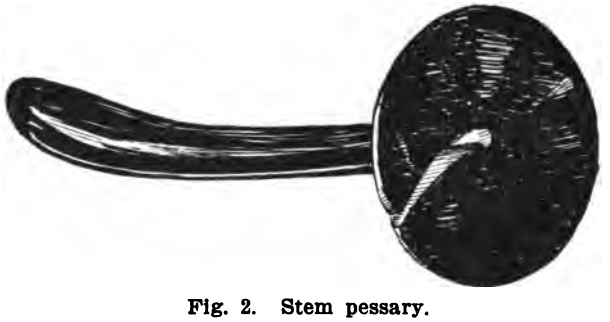

Fig. 2. Stem pessary.

But as has been said these causes are only incidental and the chief and constant factor in infantilism of the genitalia or mal-development or lack of function from genital mal-development or congenital hypoplasia of the genitalis or asthenia congenitalis, all of which mean the same thing. This condition does not improve without treatment. If the function is not exercised, it disappears. So the infantilism of the genitalia without pregnancy or treatment ends in various nervous manifestations associated with decrease in menstruation or the premature menopause.

The prognosis of the condition must be based upon the local condition of the dis-

ease and upon the general evidences of infantilism. If the infantilism is slight in degree, the woman otherwise well developed and the evidences of function as judged by the menstruation good, the prognosis is good. The general condition of robustness, vital force and general health must enter into the prognosis. Infantile genitalia sometimes may exist in a marked degree in women who are of the athletic type or in women who are of the pudgily fat type. This last is itself probably an expression of the infantilism.

The local conditions, the amount and regularity of the menstruation are the chief factors in the prognosis. If there is evidence of the premature menopause, as shown by irregularity and lessening of the menstruation, this is not a good sign in the prognosis.

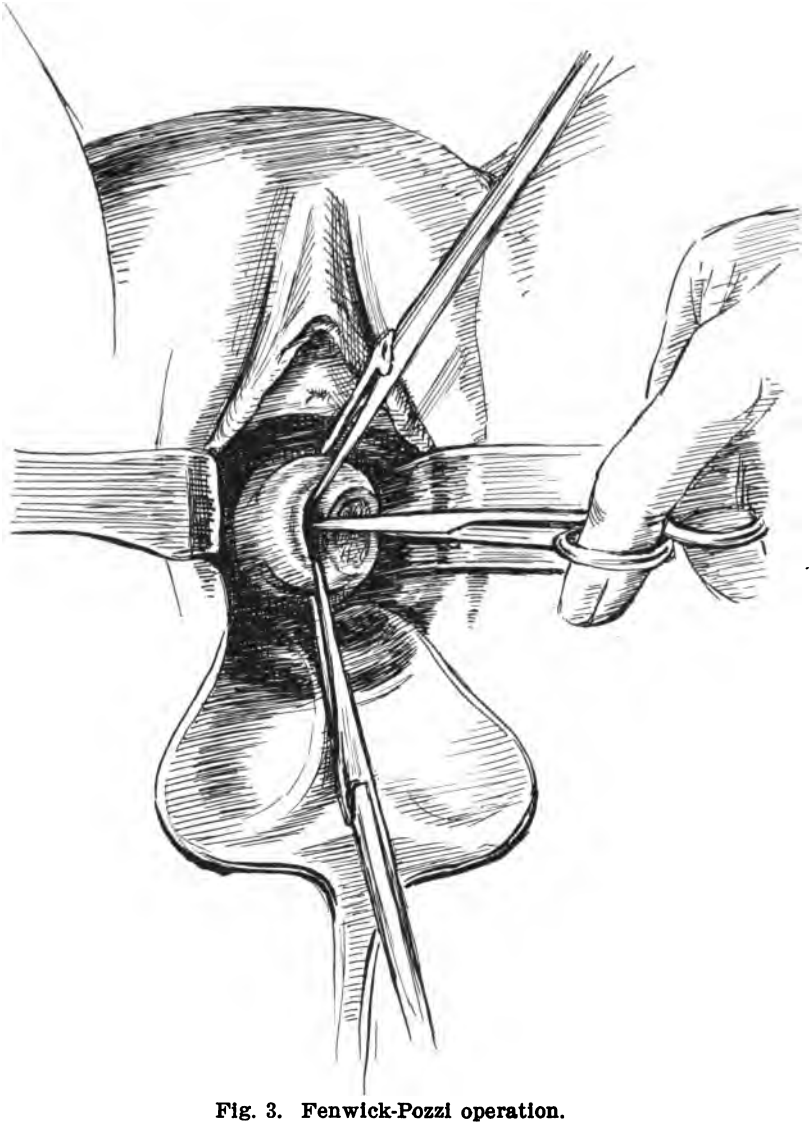

Fig. 3. Fenwick-Pozzi operation.

The male semen should always be obtained in a condom or from the vagina, and

examined before any treatment is undertaken. It is best examined upon the dark ground illumination; it is probable that sterility exists in a considerable proportion of men—placed all the way from 10 to 50 percent. In a previous exhaustive paper[1] upon this subject, the percentage of probable male sterility was placed at 25 percent. It is believed, however, that this is too high. Epididymitis is the chief cause; but it is probable that, of men having had specific urethritis, not more than six or seven percent have azoospermia from this cause. Of those who have had epididymitis only ten percent are potent; but epididymitis occurs only in about seven percent of cases of urethritis, according to Finger's statistics.

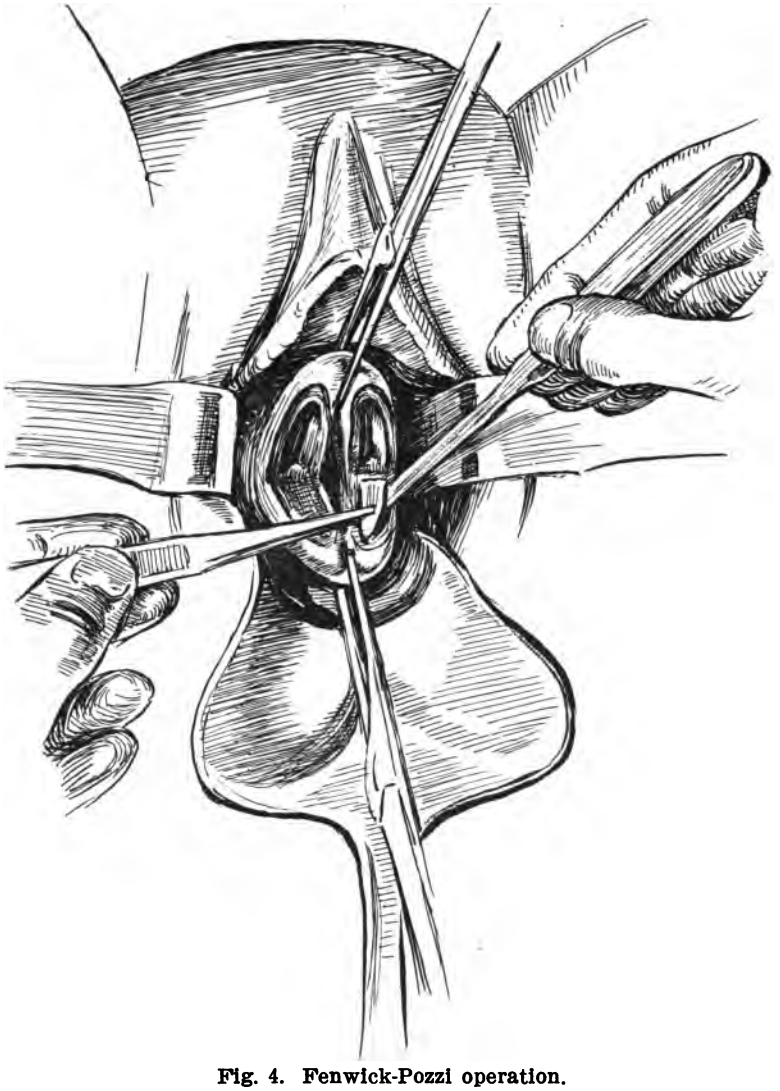

Fig. 4. Fenwick-Pozzi operation.

Infection with Neisser's coccus in women is not a frequent cause of sterility.

[1]McDonald, Ellice. Sterility in Women. *N. Y. Med. Jour.*, 1912. Dec. 23 and Dec. 30.

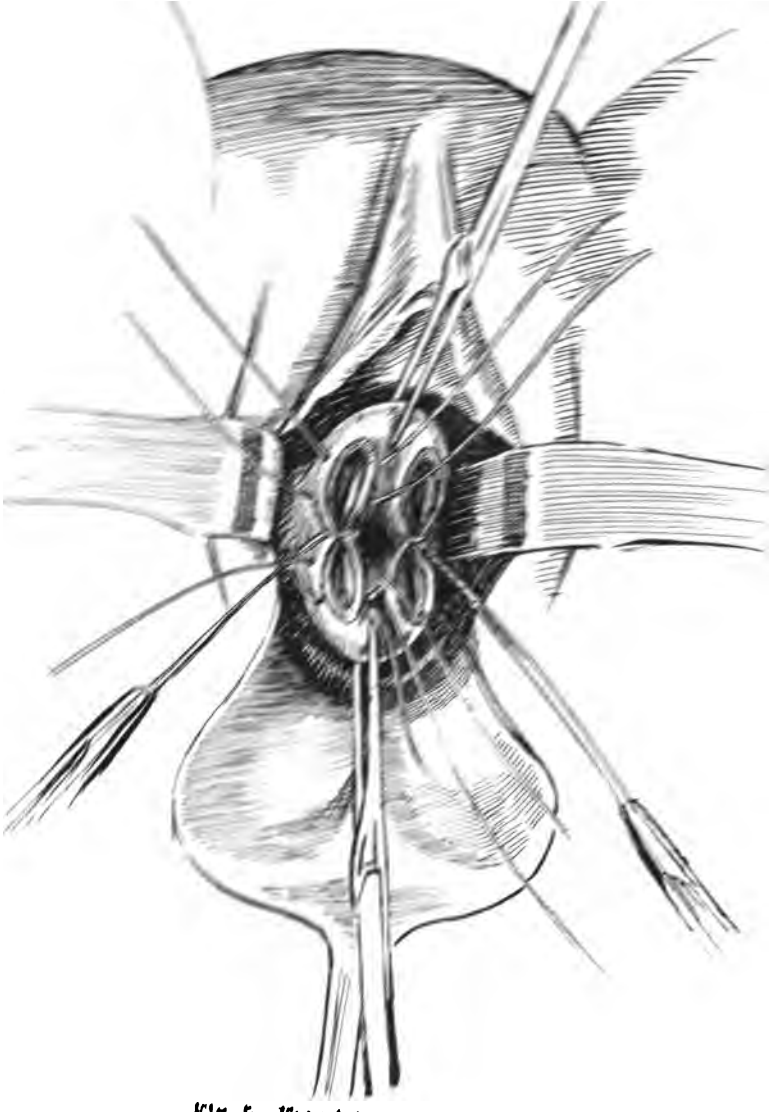

Fig. 6. Fenwick-Pozzi operation.

suffered from this disease. It is much more apt to cause one child sterility on account of its tendency to spread upwards after birth of the child. The enlarged cervix of chronic gonococcus infection with *vagina.*

The woman should be put upon a spare diet and reduced if she is fat. Excessive fat is a bar to conception, as is well known among breeders of horses and dogs. A

too generous diet is not proper. A stated amount of exercise is to be advised.

An alkaline douch should be given in order to wash away the cervical mucus and to create an alkaline medium in the vagina as the spermatozoa live best in an alkaline solution.

The following prescription for powders put up in wax paper is useful.

℞

Sodium bicarbonate .....ʒi
Sodium carbonate .....ʒi

M. Sig. Douche daily with one powder in 2 quarts of warm water.

The sodium carbonate dissolves the leukorrheal discharge and the bicarbonate the mucus.

The patient should take extract of corpus luteum as corpora lutea of beef ovary gr. V. t. i. d. p. c. This has been proved to be an ovarian stimulant and to increase the genital function in cases of deficient menstruation in the premature menopause. It sometimes increases the menstruation very decidedly, and relieves the nervous symptoms of the lessened menstruation.

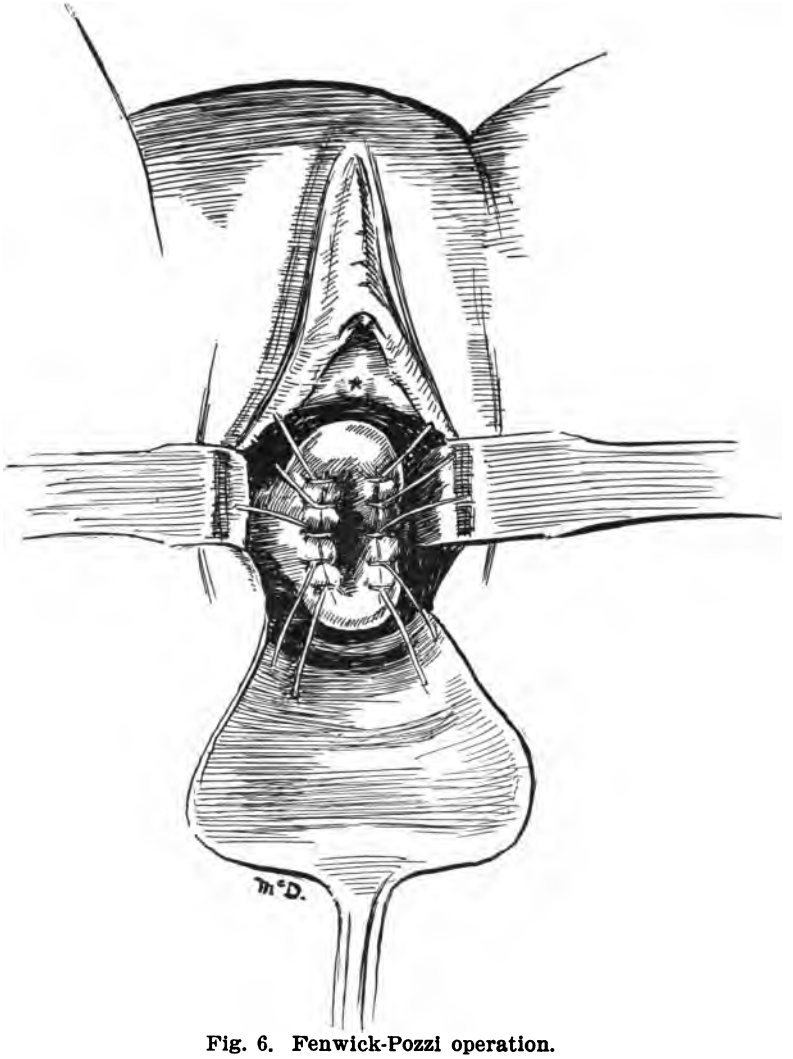

Fig. 6. Fenwick-Pozzi operation.

Corpus luteum[1] has also been proved in animals to have an influence upon the embedding of the ovum, and may do the same in women. It can do no harm.

The treatment of sterility, however, is chiefly the treatment of the infantile uterus and vagina. The vagina should be tested by injecting a colored gelatinous fluid to see whether it is retained. And, if it is expelled, the vagina may be dilated by a pessary while other procedures are being done to the uterus.

The treatment of the infantile uterus must be that of development and dilatation of the cervix. The development may be done by electrical treatment with the constant current or by the stem pessary. It should be stated here that mutilating operations should be a last resort in sterility, and that treatment is as a rule most successful which causes the least trauma. At the same time, operation is frequently indicated upon the cervix.

Absence of infection should be necessary in the electrical treatment or the stem pessary. Electrical treatment is done by the constant current with electrodes which can be sterilized about fifty milliamperes for five minutes with the negative pole in the uterus two or three times a week. It regulates the menstruation and the uterus increases in size and weight. Apostoli has reported 80 cases of conception following this treatment. It offers good results if the operator be patient and carefully clean.

Dilatation of the cervix may also be done as office treatment; but it is unsatisfactory at best.

If the patient is more than slightly maldeveloped, it is best to treat her by dilatation of the cervix and introduction of the stem pessary under an anesthetic. It is hardly possible to introduce the stem pessary properly without an anesthetic.

The uterus should be well dilated with small smooth dilators which cause little injury, particular care to be taken to dilate the upper part of the cervix at the internal os. Curettage is not necessary nor to be advised. A previous curettage gives a bad prognosis for the future treatment: it usually causes formation of scar tissue and lessens the menstruation. There is no reason why the uterus should be scraped; it denudes itself without this once a month. The pessary should be firmly inserted and sewed in or kept in by a pessary below. The stem pessary should remain two to three months. It causes no trouble at menstruation and patients often become pregnant while it is still inserted. It is the most satisfactory treatment for sterility and congestive dysmenorrhea.

This treatment is usually the most successful form of treatment to those cases of sterility to which it is applicable; but it should not be applied indiscriminately. Everything depends upon a correct diagnosis of the underlying condition. Most curative procedures are simple of execution; the selection of treatment is the only secret of medicine.

The choice should be between electrical treatment, pessary treatment, operation upon the cervix or other operative and general measures alone. This choice depends upon a knowledge of the vagaries of infantilism of the genitalia and the effect of this mal-development upon the reproductive processes.

Operation upon the cervix is suited to certain cases, particularly those with a long hard conical cervix and marked menstrual pain and congestion. It relieves the severe pain, and should but seldom

[1]McDonald, Ellice. Corpus luteum in decreased menstruation and the premature menopause. *J. A. M. A.* 1910. July 16.

be undertaken for sterility alone. The premenstrual pain furnishes the chief indication.

There are two operations upon the cervix which should be considered. The bilateral operation first described by Fenwick in 1903 and by Pozzi in 1909. The illustrations require no further description. The raw surfaces are covered as far as possible by the mucous membrane of the cervix and the aperture of the uterus left patulous. This is the preferable form of operation and Fenwick had a relief of dysmenorrhea in 91 percent and a cure of sterility in 75 percent of those cases traced. Pozzi's results are less accurately stated, but he had fourteen pregnancies in fifty cases treated both for sterility and dysmenorrhea. This operation is the last resort in sterility from infantile or undeveloped uterus with a long cervix and associated with dysmenorrhea. It should never be done in the presence of infection and general therapeutic measures and alkaline douches should be used at the same time.

The other operation is slitting of the posterior lip of the cervix of v. Herzl and Dudley. This is also of benefit in dysmenorrhea, but it is questioned whether it is as efficacious as the previous operation although based upon the same principle.

Operation upon the cervix is not indicated except when sterility is associated with considerable dysmenorrhea. That treatment is most successful which keeps the parts most normal and mutilates the least, so, unless exactly indicated, operation of the cervix should not be done.

Instrumental impregnation in certain few selected cases is occasionally of value. Ivanoff's remarkable results in animals have increased experimentation in this method. He experimented in guinea-pigs, rabbits, dogs, horses, cows, sheep, birds and mice. He established the possibility of fertilizing mammals with semen in an artificial medium entirely free from the secretion of the male accessory glands. He found that the psychic condition of the female animal and the excitement connected with copulation had nothing to do with successful conception nor with the determination of the sex of the offspring. In his experiments, conception in horses occurred more regularly with artificial than with natural fertilization when it was systematically conducted, utilizing the natural heat and the most favorable season of the year. Every one of his experiments in horses in the spring of 1901 resulted favorably. He suspended the spermatozoa in salt solution, Locke's or any weakly alkaline solution. The spermatozoa retained their fertilizing power for 24 hours after the death of the animal. It was not necessary to introduce them into the cervix as a large number of experiments resulted positively from the spermatozoa being merely placed in the vagina.

These experiments encouraged me to make trial of instrumental impregnation. A scientifically trained chemist, whose wife was sterile, asked me to undertake this form of treatment before any other.

Mrs. B. 27 years of age. Married six years, and had had no conception, although anxious for children. She was five feet two inches in height, weighed 120 lbs., and showed signs of congenital infantilism. She had a right floating kidney, a lobeless ear, a high roof to her mouth, flat feet, double jointed elbows, knees which dislocated easily, and was almost without pigment in the hair and eyes. Her uterus was small, infantile of the second type with a small cervix. Her vagina was sausage shaped and the external genitalia were infantile and poorly developed. Her pelvis was slightly contracted and masculine. True conjugate was 10 c. m. She began to menstruate at 14 years and menstruated 2½ to 3 days with moderate flow and slight pain. She complained of backache, I advised a stem pessary but, on account of a

mitral stenosis, this was debated, until at the solicitation of her husband, instrumental sterilization was attempted.

The course of treatment was as follows: She was put upon corpora lutea of beef ovary and alkaline douches. Four days after menstruation the semen was brought in a fish-skin or parchment condom which had been soaked in normal salt solution. The condom with the resulting semen was immediately placed in a thermos bottle—the condom was allowed to hang down into the water at a temperature on insertion of 100° F. The loose or open end of the condom was caught beside the cork. The patient took an alkaline douche and brought the bottle to the office. The semen was removed and placed in Locke's solution to the viscosity of thin syrup. The temperature was kept about 98° F. by means of a water bath. Injection was then made into the uterus by means of a thin silver canula, bent to conform to the shape of the uterus and a glass hypodermic syringe. Both these instruments were warmed in water before using. There was no attempt at dilatation of the cervix—nor of cleansing the vagina other than the alkaline douches. No speculum was used but the canula, full of the solution, introduced beside the finger. The instrument was passed into the cervix, passed the internal os, and about 0-60 m. of solution injected very slowly and gently into the uterus. Care was taken that no air passed in from the canula or syringe. This was done on the 11th and 19th of October. Her last menstruation occurred on the 6th of November, and she became pregnant, probably on the 19th of October. She passed her pregnancy fairly uneventfully, and labor was induced on July 4th, because of her contracted pelvis and mitral stenosis. It was thought at this time that the weight of the baby estimated by my methods was 6 lbs. 5 oz. She was delivered the same day, after a short labor, of a normal girl child weighing 6 lbs. 4 oz.: one ounce less than the estimated weight.

This case had no relations with her partner other than the two mentioned as he entered with zest into the scientific experiment, and believed that this was the only way he could have a child. The child has since thrived and grown tremendously.

Since this case I have treated four others, all unsuccessfully. One became pregnant while under treatment. She miscarried at two months. This case is not positive as she acknowledged relations with her husband during the time of treatment and outside of those necessary for the treatments. I consider this case very doubtful. The other cases were all cases of infantile genitalia.

Doderlein has also recently reported a case of successful instrumental fertilization. It is not a method which offers very great success, and should not be used save in carefully selected cases. Infection must be absolutely excluded. The injections should be done with the least possible trauma. The solutions should be mildly alkaline, such as Locke's. The spermatozoa stand heat poorly and so the temperature should never be above 100° F. The dilution should be to a thin consistency. They seem very much more active when there is considerable dilution. The solution should always first be examined under the microscope to ascertain the activity of the spermatozoa. The less trauma to the uterus from instruments the more probability of success.

It is not a treatment which commends to the esthetic tastes, but will occasionally give a good result, and no doubt some harm will result from ill-chosen cases.

The main indication in the treatment of sterility must be directed toward the chief cause, infantilism of the genitalia, particularly of the uterus. The treatment, if carefully done, should involve no injury or danger to the woman. Failure leaves her no worse for her experience; success brings a joy to the parents and a lasting visible satisfaction to the physician.

There is no more pleasant memory in medicine than the thought of such victories.

CHAPTER II.

THE TREATMENT OF CYSTITIS IN WOMEN, WITH REMARKS ON THE PRACTICAL VALUE OF THE CYSTOSCOPE.

The modern treatment of cystitis is the product of recent years: its development has depended upon improvement in the structure of the cystoscope and the increase in

skill and knowledge of its use. At the present time there is no reason why every inflamed bladder in women should not be examined cystoscopically and its treatment intelligently directed and controlled by visual inspection.

The passage of a small examining cystoscope of a No. 14 size (three-sixteenths of an inch in diameter) is not a matter which causes very great discomfort or disturbance. It can be usually slipped in without the patient knowing what is happening, if it is well lubricated, and examination can often be made by the retained urine alone without water dilatation. Examination through the urine, of course, does not give as good results as does water dilatation; but it is a useful method to avoid unnecessary manipulation. Cocaine or anesthetic solutions are never necessary in women. I have not used a cocaine solution for six years.

The ease of insertion of the modern cystoscope makes possible direct inspection of the site of inflammation and usual knowledge of the effects of treatment: in this way, it is possible to control and cure affections of the bladder in a direct and efficient manner. It is possible to make an exact diagnosis of the bladder lesion and appropriate treatment may be directed toward it.

If, however, no cystoscopic examination is made in cases of cystitis, it is impossible to localize the site of inflammation, acquire any knowledge of its size and location, or eliminate grave and dangerous affections of the kidney and adjacent organs. Many bladder and kidney lesions may produce mild symptoms, yet be of such momentous character as to make their early diagnosis a necessity for the welfare of the patients.

It is possible with the cystoscope to detect the presence of inflammation by the appearance of the bladder; ulcers and tumors of the bladder wall are readily seen and treated; the source of blood in the urine, that most important symptom in genito-urinary conditions, may be definitely located and appropriately treated. An intelligent prognosis cannot be reached without a definite diagnosis of the kidney and bladder condition, and this cannot be done without visual inspection of the bladder wall and ureteral orifices; it is often necessary in addition to catheterize the ureters and obtain urine from each kidney for examination.

The cause and progress of the bladder disease and the effect of treatment upon the condition may be minutely followed by the cystoscope. Treatment may be changed to meet conditions that may arise and harmful procedures may be eliminated. There is no more reason why the female bladder should be treated without a cystoscope than the eye without an ophthalmoscope, or the nose and throat without visual inspection.

Five years ago I published the records of forty-five cases[1] of cystitis studied cystoscopically with the protocols in detail and deductions as to their treatment. This report is to relate further experiences with that treatment and reference only to particularly interesting cases will be made in order to avoid elaboration of reports.

Cystitis is a very common disease in women and is very frequently overlooked. This is because the very commonness of the disease leads women to believe that a certain amount of frequency of urination is normal and usual. This can be easily proved by asking every one of your woman patients how often she gets up at night to urinate. A woman does not get up at night

[1]McDonald, Ellice. Cystitis in women with report of forty-five cases studied cystoscopically and some modifications of treatment. *Med. Rec.* 1908. Feb. 22.

to urinate unless her bladder is not normal. Women think that a "cold in the bladder" is a usual occurrence likely to happen to any person, and do not think it the result of an inflammation or infection.

The study of the disease and its treatment is impossible without an understanding of the pathology of the condition.

The most common condition is chronic inflammation of the trigone or trigonitis, which results usually from a simple hyperemia and congestion of the vessels; actual infection may precede or follow the congestion. The line of separation between chronic congestion and chronic inflammation is often hard to determine. There is usually hyperemia with marked dilatation of the blood vessels. The intimate relations between the vesical arteries and those of the neighboring pelvic organs makes this very easy. The membrane loses its lustre, the mucosa becomes reddened and there is evidence of flaky desquamation and exfoliation of epithelial cells, leukocytes and pus. In a later stage, the mucosa of the trigone becomes velvety in appearance and, in some cases, there are proliferating processes which may lead to papillary or papilloma-like excrescences.

In pregnancy, this picture is exaggerated, as described in another article, with a considerable thickening of the bladder wall, increase in the lymphatic tissue, hypertrophy of the muscle, and a more profuse desquamation, of epithelial cells and pus. Altogether the bladder wall appears softer and thicker.

The tendency toward epithelial proliferation is marked in the acute stages of cystitis, and more so in cystitis of pregnancy. A change from the normal bladder mucosa usually occurs. The epithelium is thickened and papillary projections may rise above the surface. These processes may take on alveolar arrangement below the surface.

In chronic cystitis, the changes are more general: the mucous membrane has lost its normal pinky white appearance and appears more or less reddened. This reddening and inflammation may appear generally or only in patches as when the inflammation extends in streaks along the line of the blood vessels of the bladder wall. The mucosa is dull red in color and here and there may show small ulcerations. There is frequently desquamation of the epithelium and interstitial hemorrhages showing on the surface are not uncommon.

Those cases of chronic cystitis, which are accompanied by disturbances of the circulation or enervation of the bladder such as after certain operations, are often resistant of cure. For example, in fourteen cases after pelvic operations of various kinds, the inflammation was very difficult to cure. There were six complete hysterectomies, five ventro-suspensions, two cystocele operations, one perineorrhaphy, and one oophorectomy. The disturbance of anatomical relation in these cases seemed to be the cause of the difficulty of cure. It is interesting to note that, after supravaginal hysterectomy, where the cervix remains as a support to the bladder, there does not seem to be this difficulty. In the ventro-suspension, the bladder was divided into two cavities by the suspensory ligament and the uterus. The history of these cases has been temporary relief or cure with return of the bladder symptoms at varying intervals. The abnormality of the circulation and nutrition is sufficient to make the bladder a place of least resistance and cause a recrudescence of symptoms.

Retroversion also causes an aggravation of bladder symptoms and makes an obstacle to cure. It is not usually sufficient in itself to cause bladder irritation, but it sometimes aggravates it. This may be through the the fact that in retroversion there is sometimes residual urine: so that the bladder seldom gets thoroughly drained, or it may be from the alteration of the blood supply or enervation.

The muscle of the bladder is sometimes involved in the changes of cystitis and may hypertrophy and enlarge to project into the bladder as thick bundles or network, forming cavities into which the bladder mucosa may penetrate. This condition is usually associated with loss of bladder tone. This condition is suggestive of tabes, and was seen in three cases where there was no other evidence of syphilis. They were benefited by dilatation of the orifice and by faradization: treatment of the cystitis was done at the same time.

In these cases, there is usually a certain rigidity of the trigone, particularly of the ureteral orifices, which do not show their usual rhythmical, sphincter-like action at each exclusion of urine. The ridge between the two orifices is usually more prominent. There is usually residual urine, and the incontinence is incontinence of retention.

Stricture of the urethra is another lesion which is not confined to the male. It is usually associated with a sclerosing vulvitis, which sometimes comes in age, or after the premature menopause. It has been seen four times, and is usually associated with dilatation of the bladder and loss of tone with dribbling of urine. In one case it was so small as to hardly allow passage of a small filiform. Still, dilatation, first with urethral catheters and metal probes until a small glove-stretcher dilator could be inserted, cured all of them.

A direct history of syphilis was given in two cases which had incontinence of retention and loss of bladder power without any trabeculae or noticeable change in the bladder wall. One has a history of seventeen years with paralysis of the hand. She improved under faradization. In one case there appeared to be a syphilitic ulceration about the size of a dime upon the fundus of the bladder. There was some false membrane and it improved under mercury. Direct treatment did not seem to do it much good.

Chronic atrophic cystitis is not uncommon in women after the menopause, and it is usually associated with more or less sclerosis and atrophy of the vulvar parts. The mucosa in atrophic cystitis is dull and thickened. The blood vessels are not seen at the fundus and there is often atrophic retraction of the ureteral orifices. This process is usually accompanied by more or less irritating hypertrophic trigonitis. This condition is the most common cause of frequency of urination in women past the menopause and is not easy to cure.

Inflammation of the bladder is usually affected by congestion of adjacent organs. Thus an endocervicitis with enlargement of the cervix is a not infrequent accompaniment of a congestive hypertropic trigonitis. The intimate relations of the cervix and trigone explain this association. The enlarged cervix also often presses upon the trigone which from the existing inflammation has lost its normal elasticity and this will often cause alteration in the structure and appearance of the ureteral orifices, so that from being small elevated papillae, they become stretched, flattened and elon-

gated. A similar condition is sometimes caused by the enlarged cervix of pregnancy.

Tuberculous cystitis can be readily recognized cystoscopically if the little gray white tubercles can be seen: but after they have broken down and become ulcerated, it is more difficult to diagnose this condition cystoscopically. In the study of sedimented urine for tubercle bacilli, Ellerman and Erlandsen's method of sputum examination is of distinct value. This consists of the addition of half a volume of 0.6 per cent. sodium carbonate to the sediment and digestion for twenty-four hours. The supernatant fluid is poured off and four volumes of 0.25 per cent. sodium hydroxide is added. After careful agitating, it is brought to boiling point—then centrifugated again. This increases the chance of finding the tubercle bacilli many times. Centrifugation must be long and rapid.

No results were obtained with Rovsing's 5 per cent. carbolic acid irrigations in tuberculous cystitis except a great deal of bladder pain.

The appearance of ulceration around the orifice of a ureter is always suggestive of infection of the kidney upon that side. This is true of chronic kidney infections, such as tuberculosis of the kidney where there has been irritation of that orifice for a long time.

The treatment of these cases of cystitis has consisted of irrigations of a bland cleansing fluid. This solution usually consisted of sodium bicarbonate, one dram to the quart. This is a better solvent of mucus, pus, and albuminous substances generally than is the boric acid solution so commonly used. This is well known by otologists, who recognized the value of alkaline solutions in suppurative ear diseases. If there was a great deal of mucus, the solution was made of double strength, and, if there was a great deal of pus, one dram of sodium sulphate was added to the cleansing solution. These mixtures are bland and cleansing, and offer some advantage over the common boric acid solution.

Various antiseptic solutions were tried in the hope of finding one which would give the maximum of effect with the minimum of disturbance. It should be remembered in the treatment of cystitis that it is only in the stage of purulent cystitis that germicides are of value. The infective organism which started the process has little action in keeping up the tissue changes. The deep infiltrations and cell changes continue with the chronic irritation of the ever present urine.

The best results were obtained with quinine bisulphate from 1-3000 to 1-1000. This is a germicide of great value and is comparatively unirritating. It was used constantly as a medium for bladder dilatation in ureteral catheterization. It should be begun in the weaker strength. Antipyrin 1-100 is another useful irrigation in chronic trigonitis.

Various silver salts have been tried. The various colloidal silver salts were not used as Derby found that of these preparations argyrol and collargol are inert as bactericides and that all the colloid silver salts are inefficient in the presence of albuminous matter. The preparations may be divided into two classes: the non-irritating of low bactericidal power as argyrol and collargol and the more effective and slightly irritating bactericides as protargal.[1] Protargol 5% was used sometimes.

However, it was found that silver nitrate was the most efficient and that the less

[1]Derby, Boston. *Med. and Surg. Jour.*, 1906, Sept. 27.

amount of irritation from the newer silver salts depended upon their weakness and slow action. Silver nitrate gives as good results if the solution is fresh and weak (0.5 per cent.) and the viscosity of the solution is increased in order to obtain slowness of action. This may be done by adding glycerine 20% or other substances which do not neutralize the silver nitrate.

In acute purulent cystitis with exfoliation and pus formation, the colloid silver salts were used with hydrogen peroxide as a cleaning and antiseptic combination. It has been shown that in the treatment of necrotic endometritis and suppurating wounds, if a colloid silver compound is used along with hydrogen peroxide, the action of each is made much more effective. For this reason the two were combined in the treatment of purulent cystitis. Hydrogen peroxide, one-third strength, and protargol, 5 per cent., were injected alternately through a catheter into the bladder by means of a half-ounce syringe. The mixture was allowed to act for a few minutes, then it was washed out by the cleansing solution, injected by the same syringe. No difficulty or trouble was ever noted from distention of the bladder by the peroxide. The peroxide foam poured out of the catheter and was finally washed out by the quinine solution or the cleansing solution. This treatment is not one which would be advised for cystitis in the male, but it has given excellent results in purulent cystitis in the female.

The exfoliation, desquamation, and pus cells are in this way washed away, as they cannot be by any irrigation; the bladder mucous membrane is left clean, and is prepared for treatment by antiseptic or astringent solutions or for direct applications.

For direct applications to ulcers and localized inflamed spots, nitrate of silver fused on a metal probe, or protargol solution on a swab, was used. The patient was put in the knee-chest position, and applications were made through the Garceau cystoscope. The place for the application was first located by means of the examining cystoscope under water dilatation. If an application of a solution is required, it will be found useful to dip the end of the probe into collodion in order to make the cotton stick closely.

It was also found that in cases of acute cystitis, or cases where there had been extensive treatment, a soothing application was of benefit. Olive oil was used with some success, but finally a preparation of Irish moss was found to be the most useful. The value of this preparation consists in keeping the bladder walls apart and lubricating them, so that no friction or irritation results. The preparation is approximately the same as many lubricating jellies put up in tubes for use in vaginal examination. This soothing lubricating preparation of Irish moss is also of use in lubricating the cystoscope before its introduction into the urethra. It is prepared as follows:

Chondrus (Irish moss) 45 g.
Distilled water .....1500 c. c.

Wash the Irish moss in cold water, drain off water; wash again and drain. To the washed Irish moss add 1,500 c. c. of distilled water and boil for ten or fifteen minutes, stirring frequently. Strain through muslin with expression. To the strained Irish moss add 4,500 c. c. of boiling distilled water and filter. The process of filtration may be hastened by loosely filling the filter with absorbent cotton. Evaporate the filtrate to one-fifth by bulk, cool partially and add gomonal, 1 per cent. by weight, mix well and strain through fine white flannel which has been previously boiled. Bottle in ground glass stoppered containers of about half a pint each.

This Irish moss jelly makes a useful lubricant for examinations and may be put

up in sterilized metal paint tubes for that purpose. In bladder treatment the jelly should be diluted with hot water to a thick semisolid consistency, fit for use in a syringe.

The treatment of these cases of cystitis consisted mainly in the use of four compounds: the antiseptic quinine solution, the cleansing bicarbonate solution, the peroxide and silver combination, and the jelly of Irish moss. In addition to this, appropriate treatment was directed to ulcers by direct application of silver or curettage, as was required; chronic patches of inflammation were stimulated, and lesions in the neighboring organs were treated.

If the case was one of acute purulent bladder disease, the bladder was first inspected and a diagnosis made, the bicarbonate solution being used as the dilating fluid. The pus and shreds were then washed away by the peroxide and silver combination. The bladder was then washed and dilated by the quinine solution and more exact examination made for small ulcers, patches of inflammation, and the condition of the ureteral orifices. If it were necessary to catheterize the uterus, it was usually done under the quinine solution and after the bladder had been cleansed. It was believed that in this way danger of carrying infection upwards from the bladder was eliminated, the cleansed bladder wall and antiseptic quinine solution removing this small danger. The quinine solution gives a peculiar bluish appearance through the cystoscope, but examinations can be well made with it.

If the case is one of very acute irritation, the Irish moss jelly is injected on removal of the quinine solution. The amount of jelly injected should vary from one to four ounces. If, however, the bladder inflammation is more chronic, the patient is told to retain the quinine solution as long as possible in order to get full benefit from its antiseptic and astringent action.

In chronic cases with much congestion and irritation the peroxide and silver combination was seldom used. The aim of the treatment in all cases was first to cleanse the infected area, to direct appropriate treatment toward the special lesion, and to exercise an antiseptic astringent and stimulating action upon the mucous membranes by means of the quinine solution.

It was also found useful to use various drugs by the mouth. Infusion of buchu and fluid extract of triticum are old favorites and have no equals for making the urine bland and unirritating. Tincture of belladonna, or hyoscyamus and potassium citrate or sodium bicarbonate should be used in combination to relieve spasm and make the urine alkaline. It is required in cases of cystitis that the urine be made alkaline during the irritating stage of the disease. Acid urine is always irritating. The patient should also be directed to drink large quantities of water and a specified amount of six glasses should be named in order that the directions be carried out. Aspirin is a drug which is sometimes of use to relieve irritation; when hexamethylentetramin is used, it should be combined with an equal amount of sodium benzoate to relieve the kidney irritation which it may cause.

As the bladder is getting better, great gentleness should be used in treatment and in catheterization of the urethra as described in another article upon the prevention of catheter cystitis. Otherwise the patient may recover from her cystitis and have still

to recover from the treatment. The injury caused by the passage of a catheter may induce a urethritis. The last few treatments should be of a bland solution.

These methods have been in use for nine years in my hands and, in spite of the experimental trial of scores of other astringents and germicides, the cheap efficient substances have given me good results.

CHAPTER III.

THE TREATMENT OF LEUCORRHEA DUE TO GONOCOCCUS INFECTION.

General Considerations.—Leucorrhea, white or purulent discharge, is one of the commonest symptoms of gonococcus infection and its treatment is essentially the treatment of that infection, except in salpingitis. Not every case of leucorrhea by any manner of means is due to this infection, but leucorrhea is almost constantly found in gonococcus infection of the cervix and vulva.

The great prevalence of this form of disease in men and women makes its consideration of greatest social and economical importance. The frequency of its occurrence in the community there is no means of knowing; Zweifel and Sanger claimed that about 18 per cent. of all women have gonorrhea.[1] This may be excessive, but in any case it is suggestive of the fearful prevalence of the disease.

It was formerly taught that this infection in women was practically incurable. One professor of gynecology has stated that it were better that a millstone be tied around her neck and she be cast into the sea than that a woman should have gonorrheal infection. This pessimistic belief and teaching is responsible for the lack of treatment and investigation of the disease, and it is misleading and untrue. Gonococcus infection not only can be cured, but often is cured before it advances to salpingitis, and while the disease is still confined to the cervix and vulva. This is the stage in which local medical treatment should be applied and the stage in which the chances of cure are greatest.

Pathology.—To properly administer the treatment, the course and pathology of the disease should be understood. The disease is usually thought to be an endometritis, but there is usually no infection of the interior of the uterus save in the early acute stages, in the puerperium, or sometimes after menstruation in the early stages of the disease. The distribution of the infection, extending as it does by means of the continuity of the mucosa, is dependent upon the character and kind of mucous membrane. It readily attacks and thrives in glandular structures and unstratified epithelium. For this reason the common sites of inflammation are Skene's glands in the urethra, the vulvo-vaginal glands and the glands of the cervix. The walls of the vagina and the uterus are not usually involved, although they may be in the acute stages or when their tissue is changed or softened, as in the puerperium. The discharge which apparently comes from the uterus, is really cervical and originates from the interior of the cervix below the internal os. The cervical glands are present two-thirds or more of the way up the cervical canal.

The usual point of greatest involvement is in the duct of the glands. The inflamma-

[1]Sanger: Verhandl d. deutsch. Gesellsch., 1886, I, 177.

tion here blocks up the outlet of the gland with the result that often small cystic collections accumulate. If the gland is not blocked, there is a purulent discharge from it. This discharge usually becomes worse after the cessation of the menstruation, when there is usually a slight exacerbation of the disease. The cervix becomes enlarged, often nodular from cystic collections and indurated. This is due to the products of inflammatory disease and principally plasma cells and lymphocytes. The presence of an exceptionally large number of plasma cells macroscopically is almost characteristic of gonorrheal cervical infection. The exudate contains a large number of polymorphonuclear leukocytes, which are present immediately below the epithelium. There are also seen numbers of deeply staining basophilic granular irregular minute bodies, the so-called Fleming's bodies. There are also sometimes seen in the submucosa a few hyaline pink-staining bodies varying in size from one to six times the diameter of a plasma cell. The microscopic appearance of the tissue suggests that the lesions are the result of periodical exacerbations and remissions of the inflammation which has spread and lights up again and again from the mucous surface.

Diagnosis.— The diagnosis is often very difficult. The history of an attack of frequency of urination and discharge is of most value. This discharge is usually worse after a menstrual period. Inflammation of the trigone of the bladder is common. The inflammation may be noted in the red orifices of the vulvo-vaginal glands, sometimes in the urethral glands and in the thickened inflamed indurated cervix. If examination takes place soon after a menstruation, the reddened spots are more easily seen.

The microscopic examination of the discharge offers some evidence. There are usually in simple leucorrhea, numerous flat epithelial cells, which stain well with disintegrated cellules with proliferating nuclei and lymphocytes with numerous cocci, Doderlein's or other bacteria. In gonococcus infection, on the contrary, there are few flat normal vaginal cells, many disintegrated or degenerating epithelial cells, numerous polymorphonuclear leukocytes with often the characteristic biscuit-shaped organisms often intracellular. The appearance of the organism must be very characteristic, before the diagnosis can be made, as the vagina often harbors cocci both Gram-positive and Gram-negative, which are very like the gonococcus. The gonococcus is also often absent in the first stages of the infection.

The exact diagnosis of the disease must depend upon cultural methods, although it is usually easy to reach a presumptive diagnosis without them. Cultures taken from the cervical discharge usually give poor results, as the microorganisms are often dead. Sometimes during an exacerbation, as after menstruation, a growth may be got from the discharge, but better results are obtained from swabs taken by rubbing the sterile cotton on a stick like diphtheria tubes directly over the infected mucous surface. In this way, organisms are obtained directly from the tissues where they grow. This should be done, if possible, about two days after menstruation ceases. The culture media should be hemoglobin agar, such as described in my article upon puerperal gonococcus infection.

Course and Prognosis.—The chronic course of the disease is due to certain influences which affect it adversely. The factors which excite the disease and cause

its extension and continuance are (1) repeated fresh infections, (2) coitus, (3) menstruation, (4) pregnancy, (5) sharp curettage and (6) tamponage. When it is considered how often all these occur, it is no wonder the disease is considered difficult to cure.

The repeated fresh infections, if from the husband, are usually explained by fresh or chronic old infection; although Erb thinks that our estimates of this have been exaggerated and that, of 2,400 male patients, who had had gonorrhea, only 4.5 per cent. infected their wives.[1] But in any case, this should be considered.

Treatment.— Menstruation, pregnancy, and coitus, all do harm from the addition of congestion and distribution of the infection. During menstruation and for three days after, the patient should remain very quiet and take all the rest possible, in order to limit the extension of the disease. After pregnancy, the tendency is for the disease to extend, as is described in the article on puerperal gonococcus infection. Coitus should be restricted during the acute stages and not allowed until the cervix appears normal.

Sharp curettage of the uterus does harm, because it bares a raw surface which is not infected and causes infection in an area not previously involved. The gonococcus can find no permanent hold in the uterine mucosa, provided it is not injured, but after curettage or after pregnancy, the raw surface and exudation, as a result of the inflammation caused by the trauma, offer a fine nidus and a good culture medium for the extension of the gonococcus. It is true that the endometrium usually recovers, but in the meantime an opportunity has been given for extension of the disease to the Fallopian tubes with its attendant dangers and discomforts. This upward tendency also exists after pregnancy. Why sharp curettage should ever be advised in this disease or for leucorrhea is impossible to explain. It injures the only uninvolved part and does no good but actual harm. It is like shooting the innocent bystander in a street brawl. An example of this is a report of six cases, reported by Holden,[1] which were curetted and the pelvic organs noted as "apparently normal," but returned some time afterwards and had their Fallopian tubes excised for purulent salpingitis.

But the whole treatment of the disease has been based upon empiricism and a false idea of the pathological anatomy. Another hoary myth is the belief that the introduction of tampons does good. Why should they? The essential points in the treatment of the condition must be lack of congestion and irritation, rest and free drainage, with proper germicidal measures. The tampon is an irritative foreign body which obstructs drainage and macerates the mucosa, so that extension of the infection is more likely and occlusion of the ducts of the glands more easy. If any antiseptic is introduced with it, the continued application is irritating, as for example, ichthyol-glycerine tampons with which almost every one has had the experience of getting a fine cast of the vagina. It has the effect of a moist glycerine dressing. Let any one experiment with a moist glycerine dressing upon one of his own mucous surfaces and he will find what irritation and maceration it produces. So influenced was I by custom and previous practice that I introduced

[1]Erb: *Münch. med. Wochens.*, 1906, 27. *Münch. med. Wochens.*, 1907, 31.

[1]Holden: *American Medicine*, 1905, Nov. 4.

several thousand tampons before I was convinced of their harm and uselessness. Such is the influence of tradition. I tamponed with all mixtures and shades and percentages of glycerine, ichthyol, boric acid, chloral and such. I tamponed one woman with gonococcus infection twice a week for two years, at the end of which time she was worse than in the beginning, and the disease had extended to the tubes. But it had a great psychic influence—but none on the disease. The facts are that nobody actually knows what good tampons do, save in prolapse or retroversion; but it is something to do, and many things are done, because it makes the physician and patient feel something is being done for the disease. It will go the way of intrauterine applications to oblivion.

The essentials in the treatment are free drainage and germicidal applications and douches. The infection lurks in the glands of the cervix and upon the mucosa. The indication is to drain the obstructed glands and apply real germicides to the mucosa.

The drainage of the obstructed glands is best obtained by the electric thermocautery. A small narrow wire loop point should be used about the breadth of the lead of an ordinary pencil. The cauterization is best done in the middle of the menstrual month and should be preceded by germicidal douches. With a bivalve speculum exposing the cervix, the small cautery at a red heat is thrust into each eminence and cystic collection in the indurated and inflamed cervix. It is also thrust about ⅛ inch into places in the cervix where it seems most indurated and inflamed. In all, about 10-20 punctures with the cautery may be done at one sitting. A month should elapse between cauterizations. This treatment opens the glands and destroys collections and relieves congestion, so that the cervical circulation may take care of the infection. It seldom needs to be done more than three times, unless there is continued reinfection. The patient should keep quiet after the treatment for two days and should be warned that the discharge is apt to increase at first. This treatment is not needed more than once in most cases. It is not painful, it does no harm and may even be done in the presence of salpingitis. It is, however, most applicable to the chronic or subacute stages of the disease. In the acute stages, rest and proper douching are the chief indications.

In addition to this treatment, applications of germicides are made to the cervix and the infected glands of the vulva and urethra. The cervix is swabbed and the glands of the vulva are probed. Several germicides may be used.

Tincture of iodine is an old favorite. This has a Rideal-Walker carbolic acid coefficient of 2, that is, it is twice as germicidal as pure carbolic acid. Chlor-meta-kresol is a halogen compound which makes a useful applicant. This, in the 50 per cent. oily solution, has a Rideal-Walker carbolic acid coefficient of 11.5. It is a useful application and causes little pain. The oily solution has an advantage of continued slow action.

This substance is also useful to give in douches in 1-1000 of the oily fifty per cent. solution. It can be afterwards increased to 1-500. Occasionally it causes tingling, but is non-toxic and only slightly affected by albuminous fluids and is perfectly harmless to the mucosa. Its high germicidal action makes it of use. After the discharge begins to lessen and all the cauterizations

have healed, it is best to use a plain alkaline douche of soda bicarb. ℥ii, sod. sulphat. ℥ii to 2 quarts of warm water.

The use of bichloride of mercury and formalin douches are illogical in this condition. Bichloride in the presence of organic tissue, such as mucosa, or albuminous discharges, become inert. The leucorrheal discharge neutralizes it, so that the action of the douche is only mechanical and not germicidal—another illusion of which the treatment of this disease has been made up.

Precautions should be taken in regard to rest at the menstruation, care of the bowels and general health, prevention of reinfection, etc. But the active treatment of the disease should be confined to the cautery, douches of real germicidal value and occasional local applications of a germicide. In this way, rest, drainage and cleanliness are obtained, and the disease may be cured and the extension to the Fallopian tubes prevented. It is only our inefficient and illogical methods which have made this disease appear hard to cure.

CHAPTER IV.

THE TREATMENT OF FIBROID TUMORS, WITH REPORT OF 700 CASES.

The study of uterine fibroids has a direct bearing upon their treatment. If these growths cause no more trouble than uterine hemorrhage, their treatment may be decided upon after consideration of how severe is the hemorrhage: but if there are other dangers, then the treatment must be chosen after consideration not only of the present symptoms, but also of the probable changes which may occur in the tumor and their danger to life.

With the hope of being able to obtain some idea of the degenerations and the relation of malignant changes, 700 tumors were studied. In any such series it is of importance that it should be carefully done and all tumors should be examined microscopically. It has been thought best not to combine with this series any others as a single series of such numbers is of more value than an aggregation of cases unevenly prepared and collected from many operators. The cases have been studied from the point of view of age and its relation to cancerous changes and degenerations and the tables tell their own tale.

TABULAR ANALYSIS OF AGE, COMPLICATIONS AND DEGENERATIONS OF 700 FIBROID TUMORS.

TABLE 1. CHARACTER OF TUMORS.

	No.	%
Single	238	34
Multiple	462	66
Small, up to 4 c. m.	257	36.7
Medium, 4-8 c. m.	209	29.8
Large, above 8 c. m.	234	33.5
Subserous	136	19.5
Interstitial	190	27.1
Submucous	75	10.7
Combined	299	42.7

TABLE 2. DEGENERATIONS AND MALIGNANT CHANGES.

(A.) *Degenerations of Tumor.*

	No.	%
Hyaline	127	18
Calcareous	65	9
Cystic	20	3
Hemorrhagic	14	2
Necrotic	57	8
Adenomyoma	23	3

(B.) *Associated Malignant Changes.*

	No.	%
Adenocarcinoma	20	2.9
Squamous carcinoma	6	0.8
Sarcoma	7	1
Chorioepithelioma malignum	2	0.3
Total malignant changes	35	5

TABLE 3. COMPLICATIONS OF TUMORS.

	No.	%
Ovarian cysts	53	7.5
Cystic ovaries	141	20
Ovarian fibroma	8	
Ovarian carcinoma	5	
Salpingitis	194	27.5
Appendicitis or Periappendicitis	148	21

TABLE 4. AGE OF PATIENT.

Age	No.	%	Age	No.	%
20-30	19	2.7	50-60	95	12
30-40	233	33	60-70	21	3
40-50	332				

TABLE 5. RELATION OF AGE TO DEGENERATIONS.

(A.) *Necrosis.*

Age.	%
20-30	5
30-40	7.7
40-50	7.5
50-60	9.3
60-70	29

(B.) *Calcareous Degeneration.*

Age.	%
20-30	0
30-40	2
40-50	16
50-60	14
60-70	10

(C.) *Hyaline Degeneration.*

Age.	%
20-30	11
30-40	11.5
40-50	16.8
50-60	16.6
60-70	10

(D.) *Adenocarcinoma.*

Age.	%
20-30	0
30-40	0
40-50	3.6
50-60	6.3
60-70	9.5

(E.) *Squamous Carcinoma.*

Age	%
20-30	0
30-40	0.4
40-50	0.3
50-60	3
60-70	4.6

(F.) *Sarcoma.*

Age.	%
20-30	0
30-40	0
40-50	0.6
50-60	3
60-70	9.5

(G.) *Chorioepithelioma.*

Age.	%
20-30	0
30-40	0
40-50	0.6
50-60	0
60-70	0

(H.) *Total Malignant Tumors.*

Age.	%
20-30	0
30-40	0
40-50	5
50-60	12.7
60-70	23.8

Autopsies 26
Heart Lesions at Autopsy 11.5

A consideration of this table shows that the older a patient the more danger from the fibroid tumor. The older the patient the greater probability there is of malignant changes and other dangerous degeneration, such as necrosis. This shows that the menopause does not relieve the patient from danger from fibroids save from the hemorrhage. Other and more dangerous complications remain and increase in degree with each succeeding year.

The menopause, which does not come until the average of 48 years in normal women, according to Norris' study, is commonly delayed longer in women with fibroid tumors on account of the additional congestive irritation and blood supply of the tumors in the uterus. So that it is not fair to advise a woman with a fibroid tumor to wait until 45 years for a menopause which does not come until 50 years. and does not cure when it does arrive, but brings greater dangers with it. Operation at the time of election must be the treatment of fibroid tumors instead of temporary conservative treatment and operation of urgency with a large mortality when dangerous symptoms or malignant complications intervene.

Malignant change took place in 5 percent. of all tumors. Adenocarcinoma of the fundus formed the greatest part of these changes. This form of cancer, as pointed out by me in 1904, has some predilection for fibroid tumors, as it is by far the most common form of malignant association. Fundal cancer, usually in other cases than fibroids, is found about one-sixth as frequently as squamous carcinoma of the cervix, while with fibroids the first is found more than three times more frequently than the second.

Apart from malignancy, necrosis is present in 8 percent, and this percentage increases with age. Necrosis must increase the mortality at operation, and cannot exist long without bacterial contamination. Other complications, such as changes in the adjacent viscera, salpingitis, appendicitis, etc., make up a list which every physician who advises against operation in fibroid tumors should view with appreciative alarm.

The dangers from fibroids in patients more than 40 years are much greater than before this time. If operation is done before grave complications intervene, the operation may be one of choice and with a low mortality, but when necroses,

malignant changes or hemorrhage compel operative measures in a weakened patient, the mortality is large.

The consideration, therefore, of this series of fibroid tumors warrants the following conclusions.

1. The menopause does not bring a cure to fibroids; on the contrary, increasing age increases the danger from these growths.

2. There is little danger of malignancy arising in fibroids before the fortieth year of the patient, after which time the danger increases with each year.

3. In view of the sarcomatous changes, carcinomatous associations and other degenerations of uterine fibromyomas, early removal is indicated when they are of sufficient size to produce symptoms and cause the patients to seek advice. Small uncomplicated fibroids in young women do not require early treatment.

4. Thorough pathologic examination should be made of all fibroids for evidence of malignancy. The tumor should be opened at the time of operation and examined for adenocarcinoma or sarcoma. Particular study should be devoted to those tumors which are necrotic, cystic, or both, as among these are found the largest proportion of malignant changes.

5. In view of the large percentage of inflammatory changes in the Fallopian tubes and appendix, these should be examined at the time of operation and removed, if diseased.

Previous papers on fibroid tumors:
Ellice McDonald, M. D.

1. Uterine fibromyomata, 700 cases. *Jour. of Obs. and Gyn. for the Brit. Empire.* 1909, Aug.

2. Fibromyoma of the uterus complicated by cancer or sarcoma, 35 cases. *Jour. Amer. Med. Ass'n.* 1908, Mch. 20.

3. Complication and degeneration of uterine fibromyomata, 280 cases. *Jour. Amer. Med. Ass'n.* 1904, May 26.

CHAPTER V.

A NEW OBSTETRICAL FORCEPS.

Introduction.—Since the time of the Chamberlains, there has not been any very great advance in design of obstetrical forceps. Except for the addition of the pelvic curve, the improvements have all been made in the manufacture and not in the design. Tarnier's axis traction principle was, it is true, a new one, but it is doubtful whether the effect the axis traction forceps was made to attain—traction in the direction of the axis of the pelvis—cannot better be obtained by forceps without the axis traction mechanism. In other words, with a properly designed pair of forceps, if traction in direction of the axis of the pelvis cannot be obtained, it is because the operator does not know the axis of the pelvis and how to pull in it.

The chief model upon which most modern forceps have been designed is the Simpson model of which the Elliott forceps is the best type. This forceps depends for its traction upon one cross piece at the end of the forceps (see illustration) for its traction. Were this cross piece removed and the forceps to consist only of a fork there would be no possibility of traction at all. In other words, the fenestrated forceps of the Simpson and Elliott type depend for their traction upon a friction grip which is concentrated in one part of the forceps—the cross bar at the end.

As a result of this localization of the pressure and friction in one part, the forceps must be narrow within the points to ensure firmness of grip. All forceps, when judged, should be examined in the position in which they would be on the child's head—i. e., with their largest meas-

urement of separation where the biparietal diameter would come. The ideal of forceps application is over the biparietal eminences. The average biparietal diameter is 9¼ centimeters. From measurements, lead tape moulds and casts of over a hundred fetal heads, I have found that when the forceps are over an average biparietal diameter, the tips must be separated at least 5½ c. m. If they are separated less than this they cause too much pressure over the stylomastoid process and the tender facial nerve. The surest way to pass an opinion on a pair of forceps is to open them to 9¼ c. m. and measure the tips. A proof of the correctness of this assertion is that three investigators—Tarnier, Elliott and myself—have independently come to the conclusion that with the average sized head, the forceps tips should be separated 5½ c. m. for all three designs have this measurement. If the tips are narrower than this, undue pressure comes over the facial nerve with consequent increase in facial paralysis.

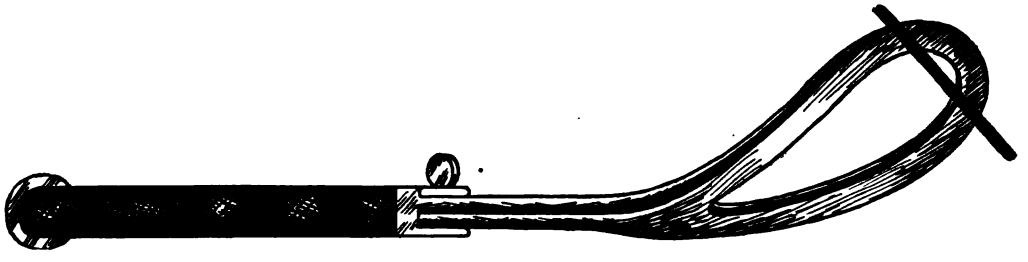

Fig. 1. Elliott forceps—showing traction bar beyond the black mark.

While the Tarnier and the Elliott have the same proportion in this measurement, on account of the pressure and friction traction being isolated at one point, the blades have to be longer than is necessary with my forceps.

With the long blades of the fenestrated forceps of the Simpson type, there is more danger of cutting off ears, getting forceps' scars, fracture of the skull, gouging out eyes, causing facial paralysis, and all the other blood-thirsty and horrible things that forceps can cause. In addition, the Simpson type forceps, because of their length, may cause injury to the mother. When the traction is in an upward direction, as it must be before the head is delivered manually, the long blades which grasp the head over the biparietal processes pivot upon these processes, and the tips of the blades, projecting beyond the head, impinge upon the pelvic floor and around the vaginal mucous membrane (Fig. 2). This may begin a perineal laceration, as, when the continuity of the mucous membrane is once broken, the stretching of the descending head causes small laceration to increase in extent just as a small tear in a piece of cotton will readily extend. This is shown in a study of perineal lacerations (McDonald, Lacerations of the Perineum, *Surgery Gyn. and Obst.*, Jan., 1908) in which it was shown that, under these circumstances, the muscles split along the lines of cleavage after the mucous membrane and fascia was once ruptured.

If the fenestrated blades are made shorter than the Elliott, they won't hold unless undue pressure is made. The Elliott forceps is the best design of its type as is attested by thousands in use, but it has the

defects of its type—pressure localized in one spot, blades too long and too broad. This makes the forceps difficult to apply and often causes injury to the mother. The operation of rotation of the head by forceps from R. O. P. is difficult with the Simpson type forceps.

Another type of forceps of a good character is the solid blade forceps, of which the Tucker-McLane forceps is the best model. These forceps have the advantage of distribution of friction-pressure and convenience from their narrowness of blade.

As a result of the broad flat smooth surface of the blade which is applied to the head, the friction-pressure is not great. On this account the blades must be made long and the points come close together so that they will hold. For this reason, the disadvantages of this type of forceps is the length of blade and the closeness of the tips. These forceps are very nice in an easy forceps operation with a normal head, but with a large head and a hard forceps operation they will slip, or else so much pressure must be made as to endanger the child.

Description.— With the idea of remedying these defects and including the advantages of both the Elliott and the Tucker-McLane forceps, I have devised a pair of forceps, which have as their basis a solid blade into which a number of slits, windows or fenestrae are cut. The blades are shorter than either of the other models and the width between the tips the same as the Elliott.

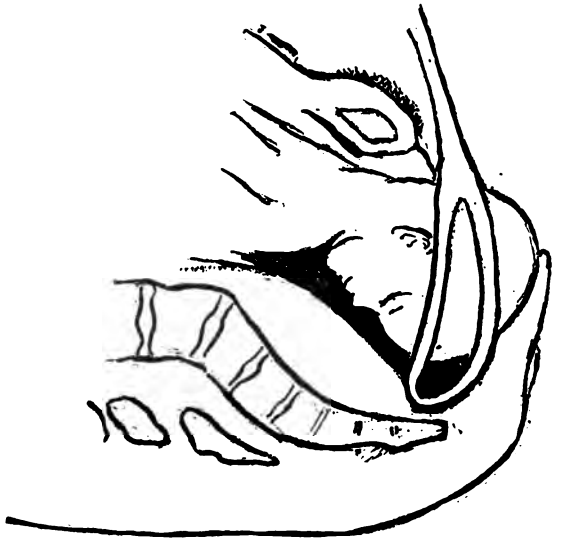

Fig. 2. Elliott forceps—showing extension beyond the head to wound the mucous membrane of the vagina.

The multiple fenestrae do not detract from the strength of the forceps nor from the ease of application. The principle is of distribution of pressure and traction by several friction points instead of one as the Elliott or a smooth surface as the solid bladed Tucker-McLane. The principle is that of the non-skid automobile tire where there are numerous friction ridges or of the non-slipping eye-glass clips where instead of one bar on the side of the nose, there are two or several. It is the prin-

ciple that two points of contact can make more pressure friction than one.

As a result of this non-slipping quality, there can be certain changes in the blade which are desirable. The blades may be shorter so as not to pinch the cord, not to make too much pressure low down over the facial nerve, to make them easy to apply, to make them easy to remove, to make the operation of rotation of the head from R. O. P. a simple one. They do not extend beyond the head and cause tears. They do not slip. They do not cause forceps scars because the pressure and friction are well distributed. If the forceps scar of an Elliott forceps is examined, it will always be found to be caused by the cross bar. The semi-fenestrated forceps will not cut off any ears nor are they likely to cause facial paralysis. They are designed to include the best qualities of the fenestrated and the solid blade forceps.

They have been in use with the multiple fenestrae since 1905. I have had nothing but good reports from them. The shortness and narrowness of blade makes it so easy to apply them that they may be more often applied to the sides of the head than other forceps. The more applications over the biparietal eminences, the place forceps were meant to be applied, the more successful the operations.

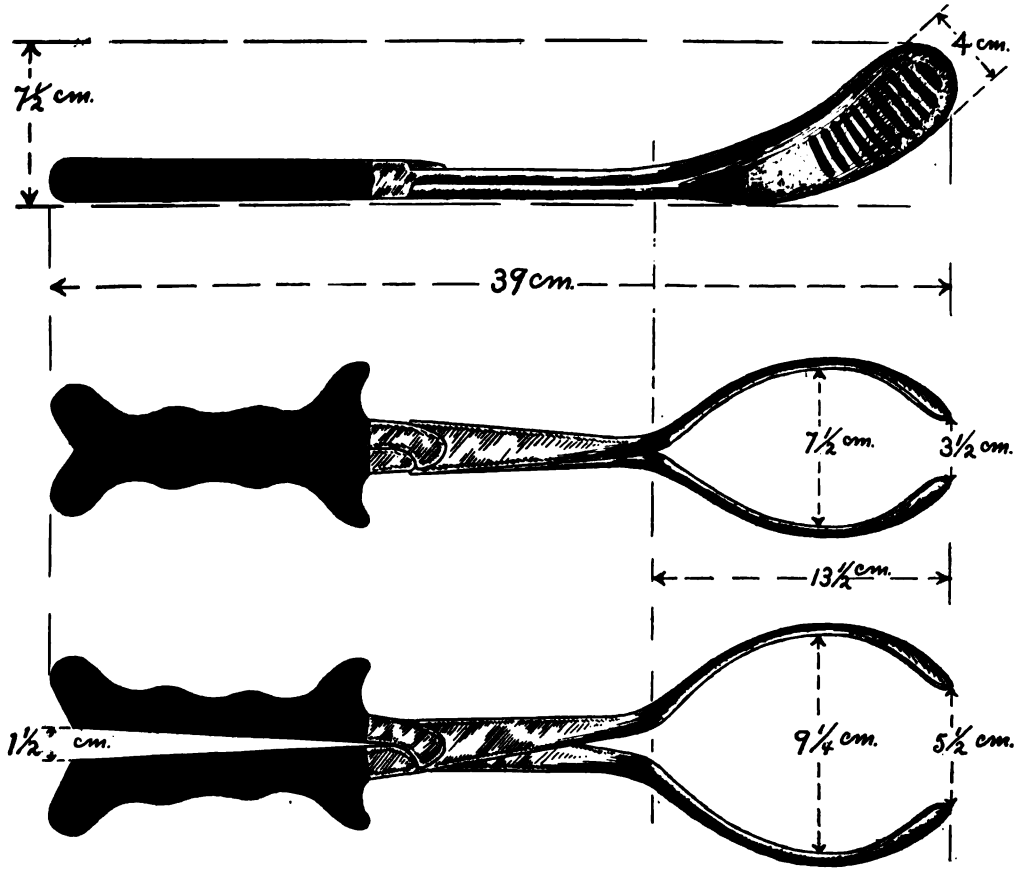

Fig. 3. Author's semi-fenestrated forceps with multiple traction bars.

CHAPTER VI.

STERILIZATION OF THE SKIN.

Introduction.—Sterilization of the skin before operation is a problem which was not solved by Grossisch's tincture of iodine method. This, although a great advance, has the disadvantage of not being a good fat solvent and causing considerable irritation. The tincture of iodine method has another disadvantage in that it must be applied by painting with the result that the aid of the mechanical effect of rubbing and scrubbing is not obtained as an aid to the penetration of the antiseptic. Of one hundred and thirteen surgeons at the German Surgical Congress, twenty-eight complained of the eczema following the tincture of iodine method. This irritation is due to the fact that the iodine method is supplemented by other mechanical methods as the tincture cannot be rubbed in. Almost all the surgeons reduced the strength of the tincture to 5 percent.

Description of Author's Method.—In order to obviate the disadvantages of the tincture of iodine solution I have used the following solution for four years, and have already reported results[1].

Author's solution:

Iodine 2%
Carbon tetrachloride 98%

This solution has all the advantages of the tincture without the disadvantages, and may be applied without previous washing. The longer application makes up for the weaker solution. The solution is rubbed with a piece of gauze over the skin for two minutes after the part has been shaved upon the table or the night previously.

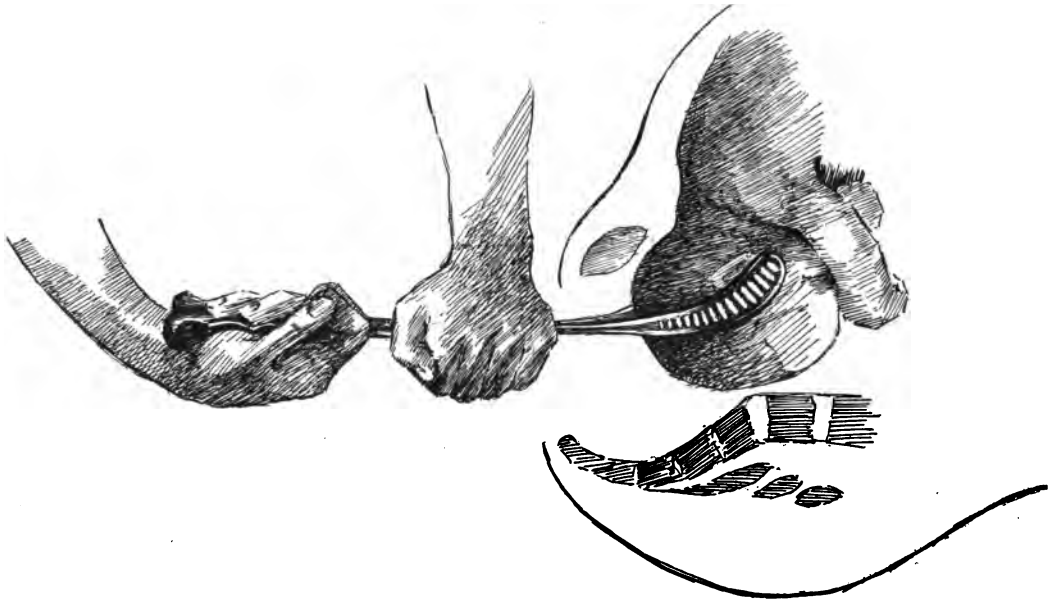

Fig. 4. Author's method of producing traction in the direction of the pelvic axis and modified Pajor's maneuvre.

The solution is not explosive, non-irritating, and cheap. Carbon tetrachloride is a heavy colorless liquid not unlike chloroform. It has itself considerable germicidal value and is a fat solvent. It is advertised under a trade name as a popular

[1]McDonald, Ellice: Sterilization of the Skin. *Med. Rec.*, 1911, Apr. 15.

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According to Beckman[1] at the Mayo Clinic, Wasserman's method is used, iodine in benzine 1-1000 (Heusner's solution) followed by three and one-half percent tincture of iodine painted on the skin. My solution has the advantage of combining these two processes into one, and has a high germicidal value as the carbon tetrachloride is more germicidal than benzine, or alcohol, and much less irritating than benzine. Heusner himself, the author of the benzine solution has added paraffin to it in order to reduce the irritating qualities.

[1]Beckman: *Interstate Medical Journal*, 1912.

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The catgut is a tendinous tissue or untanned leather, and like all such material will swell in size in the addition of water, or a water bearing solution, such as alcohol. The catgut being animal tissue also contains fat, and it is essential for sterility that this fat be removed as unless this is done the fat may harbor bacteria and so cause contamination. For this reason the sterilizing solution must be a fat solvent. The gut must remain the same size as before sterilization and not increased in size as is done by alcohol or alcohol bearing solutions—so that when the gut dries it becomes hard and stiff, and while wet is slippery and inelastic.

After considerable experimentation the following process has been adopted. It was published two years ago, and since then continuous experiment has not altered the method. I have had good reports from a number of hospitals about the method.

In order to completely obviate any faint possibility of tetanus contamination, it is well to sterilize the catgut in gross as it comes from the maker by cooking in paraffin oil at 212°-240° for half an hour. Care should be taken not to run the temperatures too high as it makes the gut brittle. It should be cooked upon a sand bath and the gut should be suspended in the oil so that none touches the sides of the vessel.

The gut in 100 ft. rolls may be cooked and then taken out and cut into desired lengths or stored before placing in the iodine-acetone solution.

Wide mouth jars with ground glass tops or preserve jars may be used for the preparation of the gut. My custom is to cut the gut into 30 inch strands and roll 4 strands together in rolls of a diameter of about 2 inches, wrapping the ends four times around. In this way the total amount for a laparotomy may be easily placed in one small jar and much handling avoided.

AUTHOR'S METHOD.

1. Cook in paraffin.
2. Iodine, 3 per cent
   Acetone (commercial), 97 per cent.
   for 8 days.
3. Acetone, 100 per cent., 8 days.
4. Preserving solution:
   Acetone, 85 per cent.
   Columbian spirits, 10 per cent.
   Glycerine, 5 per cent.

The glycerine should be dissolved in the alcohol and added to the acetone.

These solutions are fat solvent and antiseptics. The final product is smooth, soft and elastic. The ligatures are the same size as the raw gut and, when used, abstract water from the tissues, which caused the knot to become firmly welded and so avoids the tendency to unravel which is associated with the alcohol stored gut. The final cost is about 1 cent a foot, and a laparotomy may be done with a catgut cost of less than twenty-five cents.

The choice of the raw gut is of importance. It should be soft, strong and unbleached. The qualities desired in the sterilized product should be looked for in the raw gut. Gut which is clear and translucent like violin strings is not good for ligature material and, if, on pinching the gut, a white mark or crack appears it is a sign that the gut contains too much fat or that the gelatinous portion is firmly coagulated and that it will not make soft ligatures.

The method is simple and inexpensive. The ligatures are only handled once when they are put in the bottle. They will keep indefinitely provided the final solution contains no iodine: for continuous storage in iodine solution will destroy any gut. If it is required to store the gut for more than one year the gut should have two washings in the preserving solution.

CHAPTER VIII.

DIAGNOSIS OF EARLY PREGNANCY.

The diagnosis of pregnancy is one which must be settled positively or negatively in every woman patient who consults the physician. Without this it is impossible to intelligently diagnose and treat her ailment. If she is outside the child-bearing age, then the exclusion of pregnancy is not difficult, but between 15 and 50 years of age it is often a difficult question to eliminate pregnancy.

This must be done before any operation is undertaken, and almost every operator has had the experience of finding at operation an unexpected pregnancy. Unfortunate the surgeon who thus errs! He is held in execration by his patient and in derision by his colleagues. Yet the literature is full of such mistakes, although it is safe to say that the great majority are not published. Van der Veer, in 1889, collected 77 cases of abdominal section, in which unsuspected pregnancy occurred. I have been told, or have heard of at second hand, fully an equal number of cases, many of them in the hands

of most erudite and skillful physicians. This shows how difficult is the diagnosis of early pregnancy and how easy it is to make mistakes in regard to it.

The diagnosis of early pregnancy must depend upon the findings by vaginal examination, because the history is often inexact and the breast signs appear too late to be of value. Of the symptoms of pregnancy, nausea and vomiting, and cessation of menstruation are the most important. Nausea occurs in only about half of all cases and is more frequently found in elderly primiparae. It may be caused by other conditions and is only of corroborative value in the diagnosis of pregnancy.

Cessation of menstruation is of value as a sign of pregnancy, if the woman has been regular to the day, but if her menstruation has been irregular in time, then the sign is of no value whatever. Pregnancy may take place in the absence of menstruation, before puberty, in the amenorrhea of lactation, or in those who are in the habit of missing periods. Amenorrhea may occur after wasting diseases, tuberculosis, in acromegaly, tumors of the brain, particularly those of the hypophysis cerebri, fractures of the skull, sexual infantilism and the premature menopause. Menstruation may be stopped by change of climate and environment, as frequently in Irish girls coming to this country. So cessation of menstruation is of value in the diagnosis of pregnancy, if the woman has been previously absolutely regular, otherwise it is

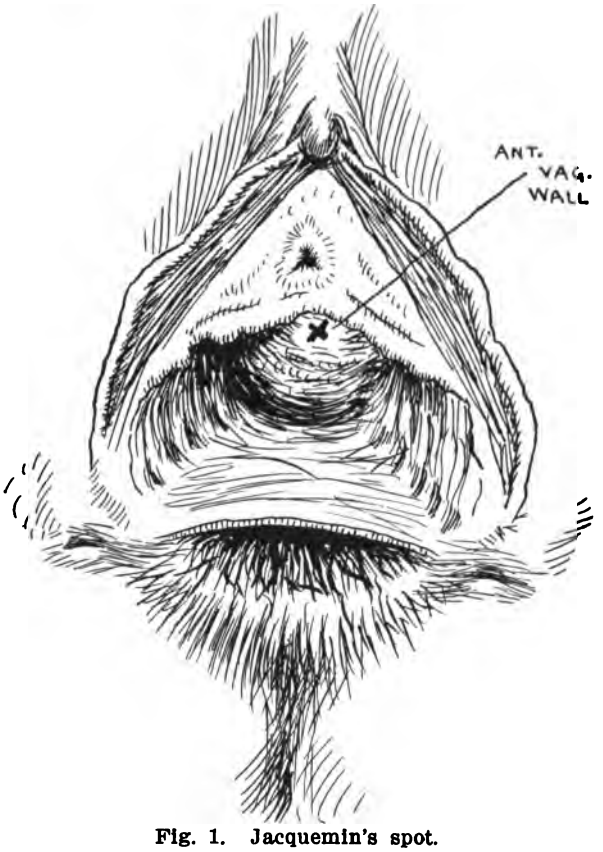

Fig. 1. Jacquemin's spot.

of no value as a diagnostic sign.

Signs on Vaginal Examination.—The diagnosis of early pregnancy must, after all, depend upon vaginal examination. The conditions caused by pregnancy of growth and increased vascularity of the uterus must first have their effect upon the uterus itself and the pelvic organs. The changes may first be expected in the uterus itself, then in the vagina and the adjacent parts. The signs of pregnancy may be divided into 1, the congestive signs, i. e., blush and flush of the vaginal mucous membrane, blush of the cervix and softening of the cervix, and 2, uterine signs, including enlargement of uterus, softening of the uterus, intermittent uterine contractions, Hegar's signs and the author's sign.

This study is based upon 150 cases carefully examined with respect to these signs, of which 100 cases were previously reported.

The duration of the pregnancy was calculated from the date of the last menstruation. This may cause a mistake in the calculation of the length of time of pregnancy, but it is the only date which can be absolutely fixed.

Great care was taken in the examination of these women in order that any tendency to error might be avoided. The diagnosis in the early weeks is one which must depend upon exactitude and skill in vaginal examination. It is of the greatest importance that the bladder should be emptied. If any urine remains within the bladder, it is impossible to appreciate any minor changes in the size, shape and consistency of the uterus. The fundus cannot be accurately outlined and the intermittent contractions of the uterus cannot be felt.

The waist bands should be loosened and the patient in good position with the hips well elevated upon an examining table or a hard bed. If necessary, a board should be put under the bed. The operator should be in an easy position and one in which he may be able to hold his examining hands perfectly still over a period of minutes in order to properly appreciate the intermittent uterine contractions. The length of vaginal examination should extend over sufficient time to recognize two contractions of the uterus with the intervening relaxation. This is usually from five to ten minutes. If the patient is upon an examining table, one should rest one's foot upon a stool or step, and the arm upon the thigh in order to have proper control of one's hand. If the patient is upon a bed, the elbow may be rested upon the mattress. In this way, it is possible to take all muscular strain off the examining hand and more delicately appreciate any of the more minute pelvic changes. The greatest possibility of error is in making too hurried an

Fig. 2. Asymmetrical enlargement.

examination and in finding a uterus in one phase of its contraction or relaxation, so masking other signs.

The cases are arranged in regard to the duration of pregnancy and to the number of times each sign was found. No case was included in the series, unless the author was convinced that it was a pregnancy, and not some condition simulating it. When Hegar's sign, the intermittent contractions of the uterus, softening of the cervix, and the author's sign of flexibility of the lower uterine segment were present, the diagnosis was considered exact. The cases are arranged in a table of 100 cases showing the percentage of the finding of the signs and the weeks at which they occurred. The additional cases bear out the table.

TABLE OF 100 CASES ARRANGED IN PERCENTAGE.

Week of Pregnancy	5	6	7	8	9	10	11	12	13	Total
Number of Cases:	6	8	12	12	15	15	12	12	8	100
Enlargement of Uterus:										
Symmetrical	0	4	9	3	9	3	9	11	5	53
To the left	2	1	2	3	3	6	2	0	2	21
To the right	4	3	1	6	3	6	1	1	1	26
Softening of the Uterus:										
Symmetrical	0	4	9	3	9	3	9	11	5	53
On the left	2	1	2	3	3	6	2	0	2	21
On the right	4	3	1	6	3	6	1	1	1	26
Jacquemin's Sign:										
Slightly	0	2	3	6	9	4	2	4	4	34
Markedly	0	0	0	3	0	6	6	4	4	23
Absent	6	6	9	3	6	5	4	4	0	43
Cervix Blush:										
Present	2	1	3	6	9	10	10	12	8	61
Absent	4	7	9	6	10	5	2	0	0	39
Cervix Softening:										
Present	2	2	6	6	8	12	10	12	8	66
Absent	4	6	6	6	7	3	2	0	0	34
Hegar's Sign:										
Absent	2	1	3	0	0	0	0	0	0	6
Moderately	2	6	6	6	9	8	4	3	1	45
Definitely	2	1	3	6	6	7	8	9	7	49
Intermittent Contractions:										
Present	3	6	12	12	9	13	11	12	8	88
Absent	3	2	0	0	4	2	1	0	0	12
Author's Sign of Flexibility of Lower Segment:										
Definitely	2	6	8	9	12	12	10	10	8	76
Moderately	2	2	3	3	4	3	2	2	0	21
Absent	2	0	1	0	0	0	0	0	0	3

Congestive Signs.— *Jacquemin's Sign.* —This sign of bluish tinge of the vaginal mucous membrane is one which was first taught in 1837 by Jacquemin. In the examination of 4,500 prostitutes in compliance with police regulations of Paris, he observed that this violet hue of the vagina was present very early in cases of pregnancy. This violet hue or blush of the vagina was likened by Jacquemin to the lees of urine or claret at the bottom of the cask. In this series, it was found that the sign was observed in about two-thirds (57%) of all cases before the thirteenth week. It was present less often in the early weeks and more often in the later ones, as may be seen from the table. It is almost constantly present at the thirteenth week. This is because, as pregnancy advances, the congestion increases, and so in the early weeks congestion is small and, as time goes on, it becomes greater.

It was found that this congestion of the vagina began as a rule at a spot about 2

cm. or a thumb's breadth below the orifice of the urethra. From this spot, the congestion and violet hue spread over the vagina. This I have called Jacquemin's spot after the discoverer of the sign of blush of the vagina. The violet color does not show at first upon the surface of the mucous membrane; but as here the mucous membrane has creases and crevices, the sign is seen as streaks of livid bluish purple at the bottom of these furrows. The phenomenon may be best seen at its first appearance by separating the labia and stretching the mucous membrane, so that these creases may be opened and the engorged veins exposed.

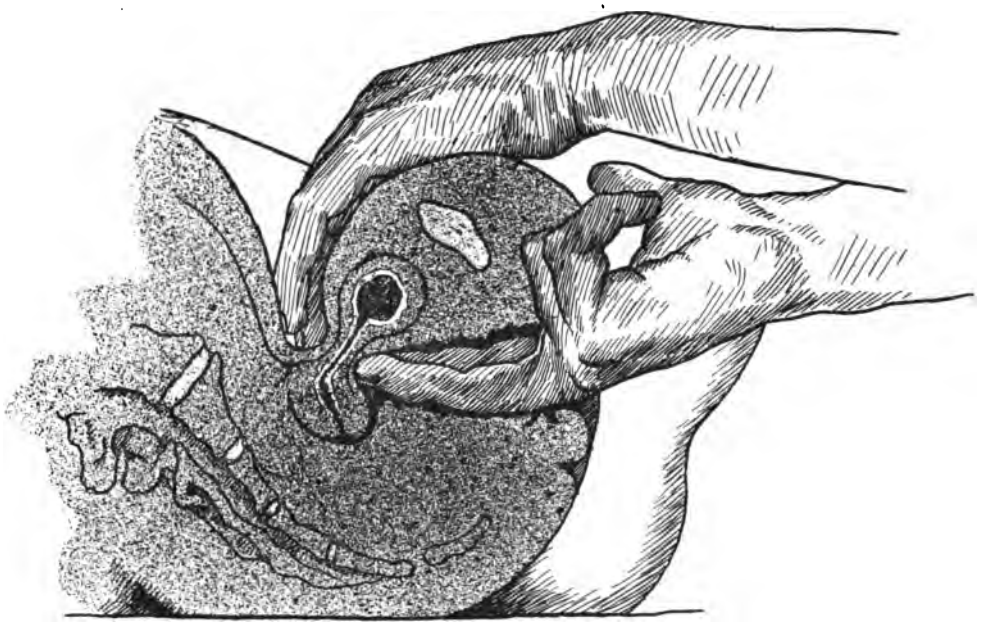

Fig. 3. Hegar's sign.

Blush of Cervix.— The violet hue of the cervix, also due to congestion, is usually a more satisfactory sign, than that of blush of the vagina. It is more definite and more frequently found. The changes of pregnancy can be depended upon to show in the uterus before they appear in the vagina. The cervical blush was present in about two-thirds of the cases, seldom in the early weeks and more constantly as pregnancy advanced, as may be seen from the table.

Softening of the Cervix.—Softening of the cervix was noticed in about the same proportion as blush of the cervix in about two-thirds (66 per cent.) of cases. The sign as may be seen from the table was not reliable until after the tenth week. The softening seemed first to occur from without inwards, the mucosa becoming congested and velvety soft, while the hard core of cervical tissue could be felt within. The cervix later increased in softness throughout.

The softening of the cervix also involves the isthmus of the uterus and so has some effect upon the position of the cervix. The cervix in the non-pregnant lies at an angle across the vagina, but with the softening of pregnancy this angle is not maintained; the pressure of the vaginal walls causes a

bend in the isthmus so that the cervix comes to be more in the axis of the vagina. This is in itself suggestive of pregnancy that the cervix should be in the same axis as the vagina.

These congestive signs of change in color and consistency of the vagina and cervix are readily caused by any congestive condition save pregnancy and are very reliable in its diagnosis after the twelfth week of gestation. Before that time they are unreliable, although offering strong corroborative evidence.

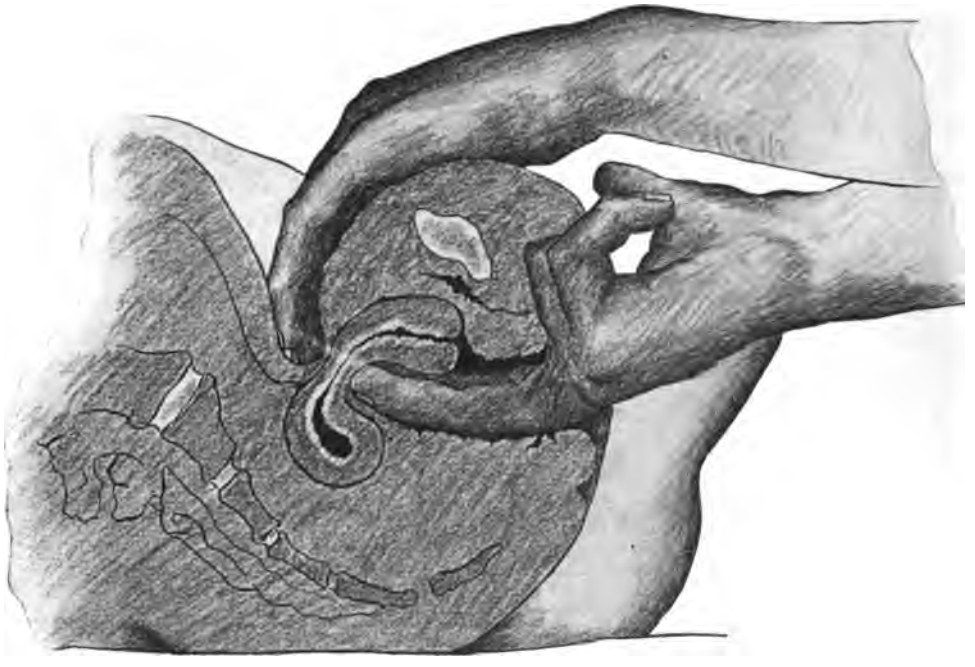

Fig. 4. Hegar's sign.

Changes in the Uterus.—The growth of the physiological tumor occurring as it does in the uterus, it is here that the first changes caused by gestation may be felt. Uterine enlargement is one of the first signs of pregnancy, and, without it, no positive diagnosis of pregnancy should ever be made. The enlargement is not, as a rule, symmetrical, but occurs in one or other horn of the uterus. In the early weeks the enlargement is not accompanied by complete softening of the uterine tissue, but is somewhat softened with scattered hard spots or islands of firm tissue, giving an impression not unlike a very soft uterus with small firm nodular fibroids.

The enlargement and softening usually progress together and are more asymmetrical in the earlier weeks, but, as growth continues, the uterus becomes more and more symmetrical until, after the tenth weeks of pregnancy may become almost an ovoid.

This asymmetry of the uterus in the early weeks of pregnancy may become almost a distortion and may give rise to grave errors of diagnosis. It is likened to a face swollen from an inflamed tooth and on account of the softness and apparent detachment from

the uterus, is not infrequently mistaken for ectopic pregnancy. The firm spots or nodules disappear after the early weeks and are believed to be due to the firm uterine tissue undergoing softening from the spread of congestion along the blood vessels.

The enlargement of the uterus is asymmetrical in more than half of the cases. It is seldom symmetrical before the seventh week and more commonly symmetrical after the tenth week after the last present menstruation. In other words, as pregnancy advances, the asymmetrical uterus becomes more and more symmetrical.

Softening of the uterus is a sign which should be taken with that of enlargement and is present in the same proportion of cases. The softening usually takes the form of an elastic doughiness with isolated firm spots or buttons. These firm spots disappear about the tenth week.

The softening and the enlargement of the uterus are usually situated upon one or other corner of the fundus and marked off from the firmer unenlarged part. The firm edge of the normal uterus tissue is very distinctly palpable.

Where there is retroversion, the congestive signs of flush of vagina, etc., are more marked and the softening of the uterus is increased out of proportion to the duration of pregnancy. The congestion of pregnancy has added to it the congestion of the retroversion of the uterus.

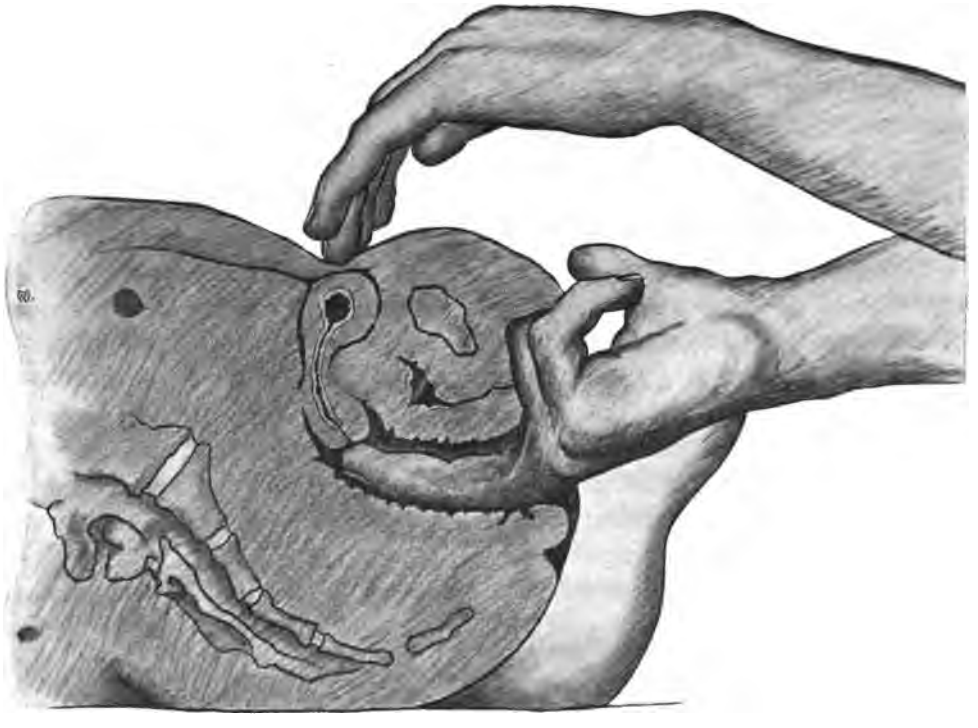

Fig. 5. Author's sign of flexibility of the isthmus of the uterus—Hinge sign.

The enlargement and softness of the uterus is often joined with a marked thinning of the uterine wall.

Intermittent Uterine Contractions.—These contractions were studied by Brax-

ton Hicks and believed by him to exist only in later pregnancy, but they occur constantly in earlier pregnancy and are always present upon vaginal examination. To be properly appreciated, the bladder must be empty and the patient's waistbands loosened.

The manipulation of the fingers upon vaginal examination are sufficient to cause a contraction, so that by the time the examination begins, a contraction is present. This contraction usually lasts from one to three minutes and is followed by a stage of relaxation of longer duration. The contraction involves the whole uterus, including the lower uterine segment and cervix. The change in color of the cervix, from pale violet to a normal pink hue, caused by the contraction, may sometimes be seen through a speculum and in a good light.

These intermittent contractions are a constant accompaniment of pregnancy and influence the value of the other signs because the contraction of the uterus make it firmer and so makes it difficult to appreciate the softening and enlargement and to elicit Hegar's and the author's signs. For this reason, these signs should be obtained during the interval of relaxation.

The uterus becomes smaller, harder and more erect. It becomes shorter and firmer. The softened part also contracts, but not so firmly, as the rest of the uterus. There is no irregularity of contraction, but the thinner, softer part contracts less forcibly.

Intermittent contractions are believed by the author to be a constant accompaniment of early pregnancy. The percentage of elicitation may be seen from the table; this is due to the fact that in the earlier cases, the value of the sign was not appreciated. Uterine contractions also occur sometimes before menstruation, in submucous fibroids, and sometimes in ectopic pregnancy.

Hegar's Sign of Compressibility of the Isthmus.— This sign depends upon the softening in the isthmus due to the increasing congestion. Hegar advised one finger in the rectum, but it is best obtained by two fingers in the anterior vaginal fornix, while the other hand is behind the fundus. When a relaxation of the uterus is present, preferably just after a contraction, the internal or vaginal fingers are thrust upwards and forwards in the direction of the patient's umbilicus. The isthmus will be felt to give or stretch like a stout elastic band. The upper fingers press down at the same time and control the maneuvre. This sign is very exact, as may be seen from the table. It is present in certain other conditions, but on the whole is very accurate.

Author's Sign of Flexibility of the Isthmus—Hinge Sign of Pregnancy.— This sign also depends upon the softening and vascularity of the lower uterine segment, but it can be appreciated before Hegar's sign of compressibility and thinning ("..... *Weichheit, Nachgiebigkeit und Verdünnung des untern Uterussegments*"). The vascularity which causes both signs allows flexibility before compression and thinning of the lower segment.

To obtain the sign, the bladder must be empty and the waistbands loosened. One hand is placed upon the abdomen and the tips of the fingers press upon the posterior part of the fundus. The palmar surfaces of the fingers in the vagina rest under the posterior aspect of the cervix. The uterus should be in a state of relaxation. The fingers of both hands are then pressed together as if to make the fundus and cervix meet. The fundus and cervix then come

easily toward each other, as if the isthmus of the uterus were a well oiled hinge. The fundus is pressed downwards and the cervix drawn upwards, as if to make the tips of the fingers of each hand meet. The uterus may often be completely doubled upon itself, although flexibility of the isthmus is in itself an expression of the sign. In retroversion the sign may be obtained by pushing the cervix backwards. The sign was present in 97 per cent. of cases.

Other signs of pregnancy as the "jug" sign, where they depend upon increased growth in the uterus, are of value later in pregnancy. Pulsation of the arteries, etc., have no constant value. A soft or fluctuating spot upon the anterior wall of the uterus is of no value in the early diagnosis, although present after the third month. The irregularity of softening and enlargement make any one spot uncertain.

The diagnosis of early pregnancy must depend upon no one sign, but upon the conjoined evidence of all signs. The congestive signs of flush of the vagina, etc., offer reliable evidence after the third month, but are of no great use before the ninth week.

The diagnosis of early pregnancy must depend upon the changes in the uterus from the growing ovum—irregular enlargement, symmetrical or otherwise, intermittent contractions, Hegar's sign and the author's sign.

These last two signs of compressibility and flexibility of the isthmus with enlargement and irregular contraction allow of a positive diagnosis being made within ten days after the missed menstruation and increase the ease of positive diagnosis at a later period.

CHAPTER IX.

PUERPERAL INFECTION FROM THE GONOCOCCUS.

With Report of a Case of Death from Gonococcus Puerperal Infection and a Resume of 17 Previously Reported Cases.

Puerperal infection is a disease which is usually associated in thought with streptococcus infection and such a commonly infecting organism as the gonococcus is overlooked. This infection is probably the most frequent form of infecting organism in maternity practice. Bumm states that approximately one-third of all his clinic cases have gonococcus infection. Stone and myself,[1] in our report of 17 cases found that gonococcus infection was present in at least ten per cent. of our cases, when only selected cases were chosen for bacteriological examination, and undoubtedly more than this percentage were infected.

The chief difficulty in the study of gonococcus puerperal infection is the difficulty of its bacteriological study. Cultural methods have only recently been made applicable to the gonococcus. This difficulty has been due to the frequency with which it occurs in association with other organisms, particularly the colon, and the fact of the difficulty of obtaining it in swab lochia cultures early in the infection, when intrauterine cultures are usually taken. However, with a better knowledge of its cultivation and the method of taking cultures for this organism, it is being more accurately studied.

[1]Stone and MacDonald, *Surgery, Gyn. and Obst.*, Dec., 1905.

Gurd has shown that cultures of the gonococcus will grow well upon hemoglobin agar of a titer from .6 to .8 per cent. phenolphthalein (hot titration). He has also shown that it is often useless to make cultures from the fluid lochia or pus, as organisms are frequently dead there; but in order to obtain exact results, cultures should be taken by scraping a swab over the infected tissue surface so as to get organisms from the tissues. The cervix should be exposed by a bivalve speculum and a swab passed into the os uteri and rubbed over the endometrium. The material of the swab is seeded over the blood agar and some isolated colonies are usually produced by this method. Within 24 to 48 hours the gonococci, if present, will appear as small, bluish-gray, semi-transparent colonies, from 0.5 to 1.5 mm. in diameter. It is a very characteristic growth on blood agar. This method and the better knowledge of the cultivation of the gonococcus has rendered most of the bacteriological work done upon the lochia of puerperal infection of no value as far as the gonococcus is concerned, and for that reason of very much less value than we formerly placed in it. It will have to be most worked over to include consideration of the gonococcus and anaerobic organisms.

The constant question among physicians is why in the last twenty years the percentage of puerperal infection has not decreased and why there is not greater freedom from it. The reason is the prevalence of gonococcus vaginal infection, its chronicity and resistance to treatment. It shows few signs of inflammation and in the puerperium lights up to cause fever, chills, salpingitis and often death. When the bacteriology of the puerperal lochia is studied in the light of newer knowledge, it will be known how much puerperal infection is due to this organism and how many times it has been overlooked.

In our 17 cases, previously reported, organisms were seldom found before the fifth day and they were easier to identify as the time went on. Streptococci were associated with two cases, one of which died and colon bacillus with one case. Eight cases had fever above 101° F. and twelve above 100° F. The fever lasted on the average four days. Nine of the seventeen had symptoms of abdominal pain which was of the character of pelvic irritation due to salpingitis and was believed to be an extension of the disease to the tubes. One case died from rupture of a gonococcus pus tube and associated streptococcus infection.

Gurd, in his series of five cases, has reported a somewhat similar case of death from gonococcus and streptococcus infection. The association is not uncommon and is apparently very dangerous, as it seems to increase the virulence of both organisms. In Gurd's four other cases of pure gonococcus infection, there were chills, marked rises of temperature and the other signs of severe puerperal infection. Mayer[1] also reported six cases with high fever, severe general infection with chills, so as to give the clinical picture of a septic condition.

These reports go to show what we maintained in 1905 that puerperal gonococcus infection is often as severe as infection with the other pyogenic organisms and that this organism is frequently overlooked in the study of puerperal infection. As an ex-

[1]Gurd: *Jour. of Med. Research*, Aug., 1910; *Am. Jour. of Med. Sciences*, Dec., 1908.

[illegible] *Gynaekol. and*

ample of the severity which pure gonococcus puerperal infection may attain, I would add the report of a case where the death occurred from puerperal infection with the gonococcus as the sole infecting organism.

CASE OF GONOCOCCUS PUERPERAL INFECTION — DEATH.

J. B., aged 25, Primipara. Full term; four hours in labor; delivery normal. Vertex R. O. A. Baby weighed 6 lbs. 8 oz., and weight at discharge was 6 lbs. It was fed artificial after the fourth day, as the danger to the child from toxins in the mother's milk was recognized. There was pain, rigidity, masses in the pelvis and a clinical picture of peritonitis on the seventh day. The lochia became purulent and creamy. Gonococcus was isolated in pure culture from the uterine lochia and on smear. A normal saline douche was given on the sixth day and a rise of temperature followed. Death occurred on the ninth day, as may be seen from the chart.

Autopsy showed bilateral pyosalpinx, peritonitis with pockets of pus all over the abdomen with marked evidence of repair. Gonococcus purulent endometritis. The gonococcus was the only organism isolated from the pus and was grown out in pure culture.

This case is an example of what severe infection may result from the gonococcus in the puerperium.

While these cases are severe and show the possibility of severe grades of infection with this organism, the usual course of the disease is not of this severity, any more than the usual course of streptococcus puerperal infection is of this degree of severity. Gonococcus puerperal infection usually runs a milder course with a comparatively low grade of fever. The most characteristic thing in this infection is the tendency to result in purulent endometritis with a purulent flow from the uterus following the cessation of the bloody lochia and the tendency of the disease to extend upward to involve the tubes in gonococcus salpingitis. For this reason, the after-effects of gonococcus infection are much more severe than streptococcus puerperal infection; for after a patient recovers from streptococcus infection, all adhesions vanish and all evidences of inflammatory remains disappear. But with gonococcus infection the tendency is toward thickening of the walls of the tubes, parametritis, pelvic peritonitis and other marked evidences of repair of tissue.

The alteration of the red lochia into the creamy purulent discharge is another evidence of the extension of this organism along the mucous membrane of the genital canal. This is its usual way of progression, although it may on occasion penetrate the uterine muscle as occurred in one of our cases. Numerous gonococci occupied spaces between the superficial epithelial cells and the intracellular connective tissue and even down into the musculature. This occurs only occasionally in the softened puerperal uterus.

One interesting phenomenon of gonococcus puerperal infection was first drawn attention to by Stone[1] and myself in 1905 and was confirmed by Mayer[2] in June, 1906, and Lobenstine and Harrar[3] in December, 1906. We found that the majority of breast-fed babies showed evidences of disturbed nutrition and intestinal disturbance. This was shown by green stools and a progressive loss of weight. The marked difference betwen the nutrition of these babies and of those nursed by non-infected women was most striking and transference in two instances to breasts of non-infected women was followed by a rapid improvement. The initial loss of weight was greater and it was recovered much more slowly. They were more subjected to rises of temperature. One-third of the babies died,

[1]Stone and McDonald: *Surgery, Gyn. and Obst.*, Dec., 1905.

[2]Mayer: *Monatsschrift f. G. & G.*, 1906, XXIV, 62.

[3]Lobenstine and Harrar: *Bull. Lying-In Hosp.* Dec., 1906.

counting in the cases of premature labor. Of Mayer's cases, one-third of the babies succumbed in the first week of life and the others were weak and their nutrition disturbed. Ishenstine and Harrar, in a study of 50 babies of gonorrheal mothers amply confirm our statement.

As a result of these observations it may be seen that the effect of gonococcus infection extends to the second generation in a way not heretofore recognized, and for these reasons it is inadvisable to allow a mother with gonococcus puerperal infection to nurse her child, at least until the effects of the infection have passed off.

The treatment of this form of puerperal infection must be largely that of prevention. The specific vaginitis is always present before labor and appropriate measures should be taken against it. This is best done by douches before labor. The value of douches before labor in preventing puerperal infection must be studied anew. They were formerly thought to be worthless and bad, because the numbers of organisms increased after douching. This was with bichloride of mercury and formalin, but it has been proved that, in aqueous solutions, these antiseptics are useless in the presence of organic tissue, such as skin, mucous membrane, blood serum, pus, etc. For this reason, instead of being antiseptics, they were only irritants. But with the advent of new efficient coal tar derivative germicides this is not true.

Burckhardt and Kolb,[1] for example, from v. Herff's clinic, in two series of 700 and 400 cases, found that the morbidity in the douched and undouched was in the first series 6.5 per cent. douched to 8.6 per cent. undouched, and 7.7 per cent. douched to 11.5 per cent. undouched in the second series. They used a halogen compound of cresol, known as chlor-meta-kresol. It is said to be powerfully germicidal, to be only slightly affected by the presence of albuminous fluids and to be perfectly harmless to the mucosa of the vagina. It is nontoxic, and they speak highly of its restraining influence on the growth of organisms.

This substance as a douche before labor for gonococcus infection is the best form of treatment which can be given. Any effort at local treatment can only end in uterine irritation and possible premature labor.

Labor should be conducted with as little traumatism and as few examinations as possible. After the infection is established, the treatment must consist of douches of the above mentioned germicide and as little operative manipulation as possible. Rest in bed for longer than the usual time should be advised. Local treatment and operation for local pus collection must be done on diagnosis of the abscess. But the greatest hope is in the prevention of the condition.

[1] Burckhardt and Kolb, *Zeits. f. G. u. G.* LXVII, 1.

CHAPTER X.

BLADDER TROUBLES IN PREGNANCY —A CYSTOSCOPIC STUDY BASED ON 54 CASES.

The proximity and intimate association of the bladder with the uterus involves it in any changes which may take place in this organ. The increase in size and blood supply of the uterus in pregnancy causes alterations to appear in the bladder. This in the very early stages of pregnancy amounts to only a congestion of the trigone. Apart from cases of cystitis twelve cases of normal early pregnancy without any bladder disturbance were examined to

ascertain i[illegible]
or distinct c[illegible]
diagnosis o[illegible]
cases were ex[illegible]
and most of [illegible]
early weeks o[illegible]
tion usually appe[illegible]
nancy and was [illegible]
about the sixth [illegible]
outlet of the uret[illegible]
and spread upward [illegible]
orifices. The spread o[illegible]
lowed the course of [illegible]
vessels.

This hyperemia had a [illegible]
fect upon any previous infl[illegible]
bladder or trigone. If there ha[illegible]
ous symptoms of trigonitis, it w[illegible]
mon to have a recrudescence o[illegible]
toms to frequency of urination [illegible]
after the addition of the congest[illegible]
pregnancy. This hyperemia is more [illegible]
in pregnancy with retroverted uterus [illegible]
cause in such conditions of retroversion [illegible]
there is a greater amount of congestion in
the early part of pregnancy, than there is
with pregnancy and anteversion. With the
advance of pregnancy the congestion of the
bladder mucosa becomes more and more
marked. The membrane loses its usual
pink-white, shell-like appearance and be-
comes a cream-yellow, and also gains the
appearance of greater thickness. It is the
difference between white China silk and
cream-colored velvet. The bladder lining
becomes more velvety and softer. There
is apparently a greater increase in edema
and a greater increase in the lymphatic tis-
sue of the bladder.

This edema is usually most marked about
the neck of the bladder. It involves the
orifices of the ureters also, so that they

[illegible]divided
[illegible]or less
[illegible].5 cm.
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usually at [illegible]
inflammation [illegible]
have [illegible]
rounded by [illegible]
cells and [illegible]

In addition, [illegible]
the whole bladder [illegible]
ance and texture [illegible]
crease in the [illegible]
ties of epithelial [illegible]
urine. This is [illegible]

istics of the bladder in pregnancy; the shedding of the epithelium and the proliferation of new cells.

In six cases of pregnant bladders, obtained at autopsy, the general picture was that to be expected from the cystoscopic examination. The muscle fibers had hypertrophied and this increase was most noticed in the external muscular layer and more particularly in the lower part of the ureter, where it lay with the bladder wall itself. This was frequently associated with small round-celled infiltration, plasma cells and edema. The epithelium showed considerable active proliferation with the appearance of many karyokinetic separations of the nuclei, and there were a considerable number of degenerating or disintegrating superficial epithelial cells with pale staining nuclei.

In the later stages of pregnancy, displacement of the bladder is the common event. This displacement is almost constantly to the right and apparently, from Martin's roentgenograms,[1] is due to the torsion of the uterus upon its longitudinal axis from left to right. The extent of the displacement is not influenced by labor, but by the size of the presenting part and by the thickness of the tissues around the bladder. The trigone and the upper part of the urethra can sometimes accompany the bladder in its displacement.

This displacement increases the congestion and edema in the pregnant bladder and there are sometimes found ecchymoses around the neck of the bladder.

These alterations in the bladder of the pregnant cause some differences in the type of inflammation which may occur, and in its treatment. There exists in pregnancy a type of inflammation which is marked by fairly generalized edema and hyperemia. Speaking generally, inflammation is much less apt not to be confined to the trigone, than in the non-pregnant, and is more apt to spread in the pregnant bladder over the rest of the bladder wall. The inflammation is more apt to be general and uniform. There is usually marked desquamation and exfoliation of epithelium and pus. The amount of pus is greater in bladder inflammations in pregnancy, than in the non-pregnant. The exfoliated cells and shreds cling to the bladder wall like small tags. The picture is that of an acute cystitis with much edema and marked congestion. The mucosa is markedly swollen, softened and boggy. The amount of pus excreted is great. The clinical picture is sufficiently characteristic to be called cystitis of pregnancy.

There is apt to be a recurrence of this inflammation with a succeeding pregnancy, as was seen in two cases that were examined in succeeding pregnancies with the same picture in each pregnancy. In one case there was hemorrhage due to the oozing of the blood from an engorged varicose vein. This recurred in each pregnancy, but was stopped by injections over the area of solutions of suprarenin. In one pregnancy the oozing continued until term after which there was a rapid recovery.

In both of the cases, in the first pregnancy, there was on account of a right-sided pain and large quantities of pus, suspected pyelitis of pregnancy. However, catheterization of the ureter showed clear urine and the cystoscopic picture explained the large amounts of pus.

[1] Martin: *Arch. f. Gynaekologie*, 1909, IXXXVIII, 2, *Zentralbl. f. Gynaek*, 1909

Fever, usually of a mild degree, may be present in cystitis of pregnancy. It is much more common, than in cystitis in the non-pregnant.

These alterations in the bladder and the different character of the inflammation explain the frequency of involvement of the kidney in pyelitis of pregnancy. The ureter loses its valve-like action and allows urine to regurgitate into the kidney pelvis. It may be that the displacement of the bladder to the right side may explain the greater frequency of involvement of the right kidney. An evidence of the fact that ascending ureteral infection is the common course in pyelitis is that the infecting organism is almost always the colon bacillus, and this is an organism rarely found in the blood.

The diagnosis of pyelitis of pregnancy should depend upon the cystoscopic examination and ureteral catheterization. It may be perfectly simulated by cystitis of pregnancy with fever, pus in the urine and right-sided pain, as may be seen from cases previously reported. In these, without ureteral catheterization, the diagnosis would have been mistaken and the wrong treatment would have been instituted.

The cystoscopic examination of the 54 cases of pregnancy shows that an old, latent trigonitis may often light up again with pregnancy and become general. A number of cases were followed throughout pregnancy and there was apparently no increase of this congestion throughout.

Cystitis in the pregnant differs a little in its treatment from cystitis in the non-pregnant. The occurrence of ulcers is not so common. When they do occur, they should not be treated locally, until the surrounding bladder has recovered. Treatment in general is better made by medicated solutions, such as quinine bisulphate 1:2,000, boric acid, nitrate of silver 1:30,000 and mild astringents. Injection of small amounts of strong silver salts is not to be advised. The patients are more influenced by rest and plenty of water, than are the non-pregnant. Hexamethylentetramin should be used with care on account of its tendency to irritate the kidneys and, when used, should be combined with sodium benzoate. The kidney of pregnancy is usually the seat of a fatty degeneration and does not have as much reserve as the non-pregnant.

In the treatment, the absence of trauma and injury is of greatest importance on account of the softened and most susceptible condition of the bladder wall. For this reason, the utmost care must be employed in using the catheter[1] as has been pointed out in another paper.

CHAPTER XI.

THE DURATION OF PREGNANCY.

The duration of human pregnancy is one of the unsettled problems of medicine and must remain so, because pregnancy has no fixed term, but varies normally within wide limits. It is a difficult matter to study because of the impossibility of being sure of the time of conception even although there is only one coitus. The spermatozoa may live for five days in the vagina and conception may take place some time after coitus. It is also difficult to be sure that only one intercourse has taken place, even although the masculine side of the question is without debate.

[1] MacDonald: Pyelitis in Pregnancy, *Am. Med.*, Dec. 1910.

The subject is one which sometimes gives rise to interesting medico-legal problems. The most famous of these is the Gardner peerage case, where the husband, a soldier, was absent from his wife 302 days before birth of a child to his wife. A more recent divorce case brought up the question whether a fully developed baby born 247 days after the return of the wife to the husband could be the offspring of the husband.

A case recently came under my notice as medical expert. The girl was married by a young man, because, she said, he had impregnated her. This was said to have occurred in September. She stated that her last menstruation was September 23d. The young man was urged to annul the marriage. Examination showed a pregnant uterus whose fundus was 24½ cm. high above the symphysis, measured according to my rule. This gave the duration of pregnancy as (24½ ÷ 3½) 7 lunar months and dated the pregnancy back to July 18th. At this time the girl was not in this country. Careful questioning brought out the truth that about that time she was in a hotel abroad, had had relations with another man and had shortly afterwards missed her menstruation and on her return had looked around for an easy victim. Had it not been that a definite statement, as based on the rule of duration of pregnancy was made the confession would not have been obtained.

As the size of the child varies, so may the duration of pregnancy. Observations upon cows, whose term of pregnancy approaches in duration that of the human animal, have shown that their period of gestation is by no means a fixed term, but varies from 240 to 321 days. The average duration was 285 days according to Tessier's researches which extended over 40 years. Earl Spencer's experiments in 724 cases corroborate those of Tessier. While the variation of the duration of pregnancy in cows is no evidence of a similar variation in the human animal, it is at least suggestive that a similar variation does occur in pregnancy in women. The range of variation is about what our researches into human pregnancy lead us to expect.

There is no doubt that pregnancy in women may be prolonged in a certain percentage of cases and several instances of abnormally long pregnancy have been reported. Winckel[1] has collected 20 cases which he has discussed in detail, and has accepted 6 cases as authentically proved prolonged pregnancy of 310, 311, 312, 324 and 336 days, with children weighing from 5770 to 7470 grams. Nine of the remaining cases he rejects as not proved, and five were not completely satisfactory. Many other isolated cases have been reported, such as those of Allen[2] and many others.

While it is difficult in many cases to estimate exactly the probable time of conception, it is conceded by obstetricians generally that prolongation of pregnancy does occur, and that the children of such pregnancies are remarkable for their large size. It is also believed that a proportion of overweight children are carried for more than the average time of pregnancy. While admitting that isolated observations prove nothing in this connection, it is evident that the average duration of many hundred cases weighing 4000 grams, and over, must have considerable force. Winckel has collected 245 cases of this great weight and estimated the duration of pregnancy

[1] *Leyden's Deutsche Klinik*, IX, 5 to 10.
[2] *Amer. Journ. Obst.*, 1907, IV, 4.

as follows, as to the time after the last menstruation:

Duration of Pregnancy in days.	After last Menstruation.
241 to 260	3.7 per cent.
261 to 270	6.1 "
271 to 280	18.3 "
281 to 290	38.0 "
291 to 300	18.8 "
301 to 310	8.5 "
311 to 336	6.6 "

This collection shows that it is not an isolated occurrence that heavyweight children are carried beyond the ordinary term of pregnancy; but it is a fairly definite proof that children are often overweight, because they are carried for longer than the ordinary term. While it is true that large infants may be the result of short pregnancies, as was the case in 3.7 per cent. of these cases, it is more common that heavy children are the result of pregnancies longer than the average 280 days, as was the result in 71.8 per cent. of this series.

In 31 of the larger babies with an average length of 53.8 cm. and an average weight of 4276 grams, the prolongation of the gestation period was 31 days, counting from the last menstrual period. The average prolongation of the gestation in infants weighing 4000 grams, or slightly less than the preceding, was 8.22 days, reckoning in the same way from the last menstruation. Thus, also, in children weighing 4000 grams it was found that 30, or 12.2 per cent. had had a gestation period of longer than 302 days, the legally determined duration of pregnancy in Germany.

Blau and Christofoletti[1] also have collected the cases of large children from 68,032 births in the clinics of Schauta and Chrobak for the years 1892 to 1901, in order to determine the correlation of large children and protracted gestation. Among 1778 children weighing more than 4,000 grams, the pregnancy lasted more than 300 days in 150 cases, and more than 302 days in 135 cases.

This seems, therefore, to be conclusive proof that pregnancy may persist for longer than 280 days and that, when it is prolonged over term, the resulting child is commonly of large size. These cases cited were clinic cases, where conditions were not favorable to large children, as repose favors the increase in weight of the child. Rest, as has been proved by Pinard[1], is a factor which may distinctly prolong the pregnancy. This may explain the difference between gestation in summer (277.2 days) and winter (279.5 days) or between married (282.4 days) and unmarried (278.2 days), as has been shown by Pinard[2]. This influence of quiet and rest will also explain the larger number of heavy children found in private practice, as the luxury of a home influences the weight of the fetus. Letourier[3] has shown that women who have fatiguing work to do have children lighter in weight than those who are able to rest during their gestation. He found an average difference of 220 grams between these classes.

The type of menstruation, the sex of the fetus, and heredity are all said to have effect upon the size of the fetus and the duration of pregnancy; but none are proved to have any influence.

On the other hand, constitution and habitus do seem to have an influence as

[1] *Monats. f. Geburtsh. u. Gyn.*, 1904.

[1] *Dictionnaire de Physiologie*, 1905, article Gestation.
[2] *Clinique Obstetricale*, 1899, 51.
[3] *Thèse de Paris*, 1897: De l'influence de la profession de la mére sur le poids de l'enfant.

Issmer[1] found an average duration of 278.6 days in robust women, and 276.8 days in weak women. He also states that there is an average increase of weight of the child in each pregnancy of 224.5 grams. The first child is the smallest, as a rule, and each succeeding pregnancy produces a larger child up to the ninth.

Another artificial cause of prolonged pregnancy is the performance of the operation of ventrofixation of the uterus. A number of long pregnancies with very large children have been reported after this operation. The most likely explanation is that the unequal development of the uterus and the thinning of the posterior wall causes the cervix to be displaced in its relation to the pelvic axis. The early pains, being weak from the thin walls, are not able to press the presenting part into the os to bring about dilatation. From the various reports it appears that the pains came on and passed off again several weeks before birth actually occurred.

While thus it may be seen that many factors affect the duration of pregnancy, Issmer has also estimated that the size of the fetus bears a relation, as a rule, to the duration of pregnancy, as follows:

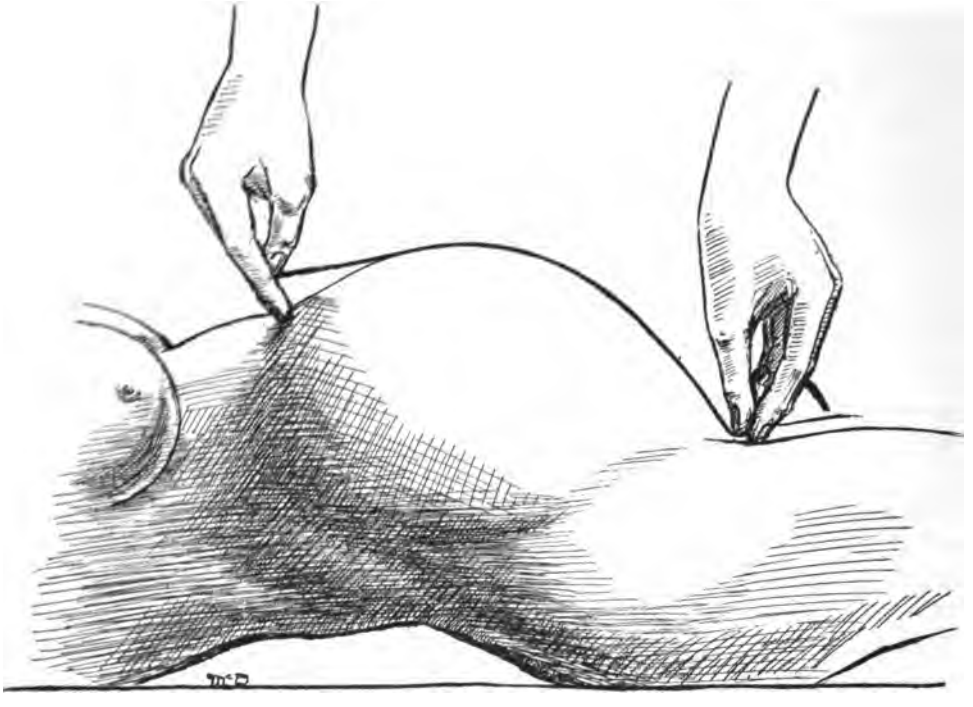

Fig. 1.

48 cm.	averages	271.3 days
49 cm.	"	278.4 "
50 cm.	"	277.1 "
51 cm.	"	282.5 "
52 cm.	"	283.6 "
53 cm.	"	286.5 "
54 cm.	"	290.0 "

He states that there may be a difference of ten to eighteen days in the duration of pregnancy; but, basing his statements on

[1] *Arch. f. Gyn.*, XXX, 277, and XXXV, 310.

the average of his large collection of cases, he says that the larger the child the longer is the pregnancy, and that the increase is in the proportion of his table. Large children do also occur in shorter pregnancies, but they are much more infrequent than when the pregnancy is prolonged.

These variations in the duration of pregnancy make it difficult to prognosticate the date of labor. If the usual rule is applied of adding seven days and subtracting three months from the date of the last menstruation, the estimate may be three weeks out of the way; but basing it upon the average duration of pregnancy, it is often correct. However, conception may have occurred immediately before the first missed menstruation, and so give a factor of error.

Since, however, the attempt to estimate the duration of pregnancy by the number of days is inexact, it might be well to attempt to estimate the duration of pregnancy from the size of the fetus. For, if the fetus may be measured and the average size of the fetus is known, the date of labor will be when the fetus arrives at average size in the great majority of cases.

So, with the hope of being able to determine the date of labor, I have evolved a rule which is dependent upon the height of the fundus of the uterus above the symphysis. The height of the fundus is dependent upon the occipitococcygeal measurement of the child, and this varies in direct proportion to the weight of the child, as does the length. The details of this proportion have been worked out in a previous paper[1].

The rule is as follows: The duration of pregnancy in lunar months is equal to the height of the uterus in centimeters divided by 3.5. It depends upon the more or less regular growth of the uterus of 3.5 cm. each month of four weeks, and is very exact after the sixth month. The measurement is taken with the patient lying flat (see figure), and one end of the tape is placed at the upper border of the symphysis, while the other is held by the thumb into the palm of the hand. The fingers of the upper hand are held at right angles to the fundus of the uterus, and the tape follows the contour of the uterus save at the last dip, as is shown in the illustration. Multiparae with lax abdominal walls and thin uteri should be supported at the side, so as to bring the occipitococcygeal axis of the pelvis into the long axis of the mother's body.

This method gives satisfactory results and is the most exact means of estimation of the duration of pregnancy. It is strictly an estimation of the size of the fetus; for when the uterus arrives at the height of 35 cm., or full term ($35 \div 3.5 = 10$ lunar months), the fetus is of a weight of 3,300 grams, or average size, as is shown by the measurements in my former paper. Thus, an average-sized baby usually comes at the average period of pregnancy—hence the rule.

After the sixth month this rule is extraordinarily exact, and is most useful in determining the date of labor and the size of the fetus, when the date of the last menstruation has been forgotten. It has been in use in my hands since 1904, and I have had good reports of it from many obstetricians, including some of my German confrères. Hamilton has reported it to me to be of great use in asylum practice in insane pregnant women who are not able to give a connected history of menstruation.

[1]Mensuration of the Child in the Uterus, *Jour. Amer. Med. Ass'n.*, December 15, 1906.

tion is obviously considerably safer for the mother and about the same for babies.[1]

If, then, we can measure the bullet as well as the bore, better results can be obtained. When we can measure the baby accurately, Caesarean section in moderately contracted pelves will be unjustifiable, except in cases consulting the physician after the infant has already grown too large for induction. A six and a quarter pound child has as good a chance of life as an average seven and a quarter pound one and lots better than a nine pounder. It is less battered in passage. Chilling, defective feeding and infections are the dangers of all young infants and these may with reasonable care be avoided.

Measuring the Baby.—In measuring the baby, what measurements are of importance? 1. The weight of the baby, because the greater the weight, the larger the head. The diameters of the head increase in fairly definite proportion with the weight. 2. The biparietal diameter, because this diameter comes closest into direct relation with the smallest pelvic measurement, the true conjugate or anteroposterior diameter.

If these two proportions of the fetus in the womb can be estimated, then the labor can be induced at such time as will give the largest child that can safely come through

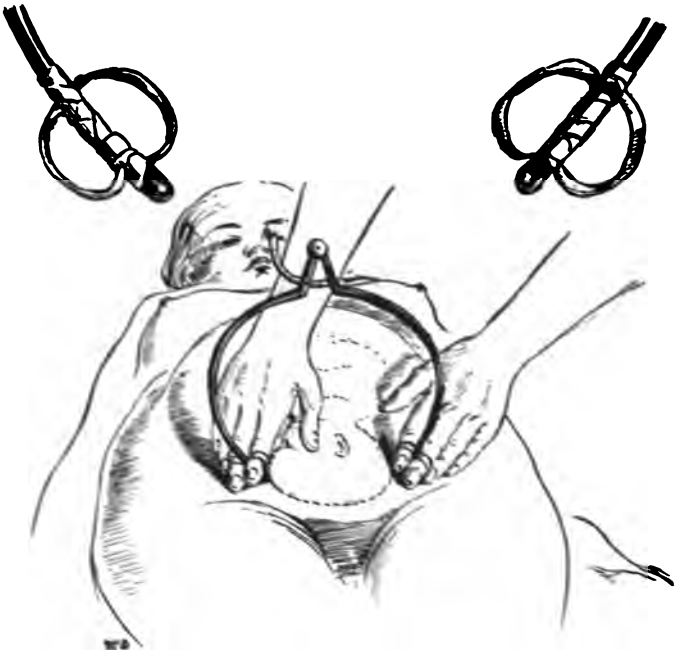

Fig. 1.

that particular pelvis. We then have a scientific basis for the obstetrical problem. Any fairly accurate approximation of the size of the child is better than none, because there has been none heretofore.

To attempt to estimate the weight of the baby within the womb is best done by means of my rule for the duration of pregnancy. This rule is strictly a rule for the estimation of the size of the child and is based upon the fact that most children of average

[1] See figures and case reports, N. Y. Med. Jour., 1912, Mar. 9 and 16.

weight, seven and one-third pounds, are delivered at the average time of pregnancy, and the fundus when the child is of this weight measures 35 cm. above the symphysis. This then is the starting point of the scale—35 cm. above the symphysis equals seven and one-third pounds (3,300 grams). From this, for purposes of estimating the weight, deduction may be made of 200 grams for every centimeter below 35 cm. Thus, if the fundus measures 31 cm. (this is four weeks before term 31 ÷ 3½ = 62 ÷ 7 =9 lunar months; see article "Duration of Pregnancy") the child weighs 2,500 grams and this weight is to be expected at that time. Induction should rarely be done when the fundus measures below 30 cm. and in fact it is better to do it above this measurement, as 2,300 grams is about the smallest limit of weight that good results for the child are obtained by induction.

If the measurement is above 35 cm., for estimation, add 200 grams for the first centimeter, 200 for the second and 250 for the third centimeter above that weight. When the measurement is above 36 cm., twins should be carefully sought for, as this has been in my hands the first indication I have had of twins on several occasions. Two babies measure more than one.

The measurement should be taken according to the directions for measuring the duration of pregnancy (see illustration) and the tape line should follow the outline of the uterus save at the last dip. It should go horizontally from the highest eminence of the uterine tumor to the upright measuring hand. This measurement must be used in correlation with the measurement of the head, which is about to be described, and one should check the other.

Fig. 2.

Measurement of the head is done through the abdominal wall. The head lies with its longest and most prominent diameter transversely in the pelvis or nearly so, and this is the only diameter which can be obtained. But it is the biparietal diameter that is

wanted. The biparietal diameter of the head fortunately bears a fairly definite relation to the occipitofrontal and so can be deduced from it. For that reason, the occipitofrontal is measured and the biparietal obtained by deduction.

An ordinary pelvimeter of simple construction (fig. 1) is taken and two rings of adhesive plaster, about 1 cm. in width, fastened to each tip. These rings are faced inside with adhesive plaster, back inward, and are made sufficiently large readily to admit the middle and index fingers. The knob-like tips of the pelvimeter should project about 1 cm. beyond the palpating fingers.

The patient is laid on her back and the operator stands as if to palpate for the position of the head. An accurate diagnosis of the fetal position, not only in regard to the occiput, but as to the amount of flexion of the head is essential to success. The bladder must be empty. The occiput and sinciput are located; then the fingers are thrust into the rings and the knobs of the instrument approximated to these points as closely as possible. The weight of the hinge side of the pelvimeter is supported by the finger of an assistant, or may be held up by a string attached to the operator's arm or buttonhole. It is necessary that the hinge side should have free play of movement in order that one or other tip may be depressed if occasion requires. The tips are held firmly against the cephalic poles and the scale is read. This gives the occipitofrontal diameter. No deduction is required. This fact is not satisfactorily explained. The abdominal walls of a pregnant woman are very thin (usually less than 1 cm. measured at Caesarean section), and it may be that the exact prominences of the cephalic poles are not reached.

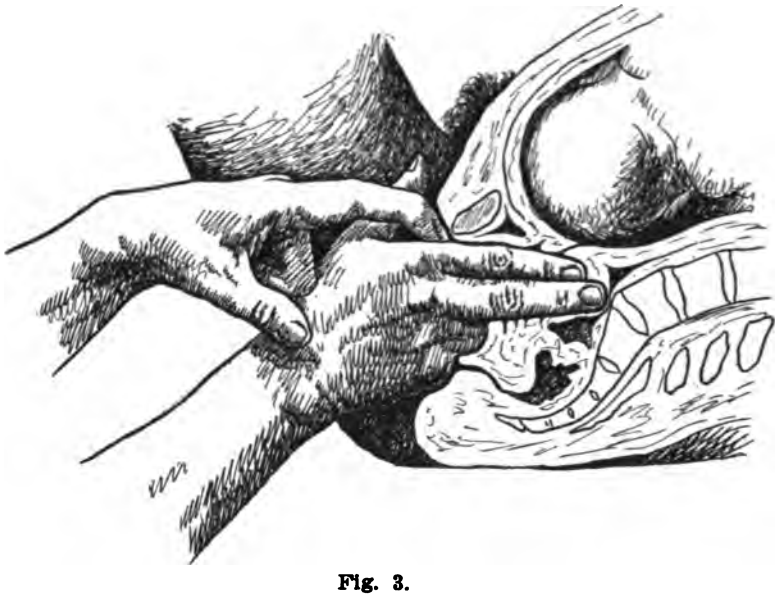

Fig. 3.

All heads above the brim, or which may be thrust above the brim, can be measured, although the greatest ease is found in thin women with flat pelves which push the head forward. Small heads with much liquor amnii are difficult to fix; breech cases offer no special difficulty. However,

heads lying above the pelvic brim and firmly placed thereon give the best conditions, e. g. in contracted pelves.

The measurement obtained by this means is the occipitofrontal diameter, and from this is obtained the important diameter, the biparietal.

The amount to be subtracted varies with the size of the occipitofrontal. *With an occipitofrontal diameter of 11.25 cm. two cm. are deducted to obtain the biparietal, from 11.5 cm. occipitofrontal 2.25 cm., and from 12 cm. occipitofrontal 2.50 cm.* This amount deducted is based upon the following table of 100 heads measured by me:

TABLE OF MEASUREMENTS OF 100 NEWBORN BABIES.

No. of cases.	O. F. diameter.	Average difference.	Average weight. Grams.
1	10	1.00	2,600
4	10.50	1.55	2,716
8	10.75	1.81	2,975
17	11	1.91	3,100
21	11.25	2.07	3,156
19	11.50	2.26	3,247
9	11.75	2.50	3,313
13	12	2.30	3,514
5	12.25	2.35	4,100
1	12.50	2.50	4,100
2	12.75	3.12	4,350

It will also be noted that the weight bears a fairly definite relation to the size of the head. This is of use in checking up the size of the child, as shown by the author's rule for the duration of pregnancy. As, for example, with a fundal measurement of 35 cm. and an occipitofrontal measurement of 11.50 cm., it can be safely estimated that the fetus is of normal size, 3,300 grams. In this way it is possible to use the fundal measurement and estimated weight as a check upon the cephalimetry with particular accuracy for the purpose of finding this ratio.

These methods have been in use in my hands for seven years and continue to give good results. In all I have measured eighty-four heads before and after delivery. In sixty cases, the occipitofrontal diameter was correctly estimated; in seventeen cases there was an error of 0.25 cm. and in six cases there was an error of 0.5 cm.; and in one case there was an error of 0.75 cm. This last case was not a fair test, as the head was well in the pelvis and could not be properly reached. Skill and practice are decided factors, but the method is soon learned.

In addition to these methods of measurement, an attempt is made to estimate the size of the head in relation to the pelvis. This is done by the Munro-Kerr modification of Müller's method and consists in attempting to force the head into the pelvis by a grasp above, while the lower hand in the vagina gauges a descent of the cephalic pole. Munro-Kerr's modification consists in holding the thumb above the brim of the pelvis as well as the fingers within the vagina.

COMBINATION OF METHODS NECESSARY.

By the use of these three methods it is possible to gain a reasonably sure idea as to the size and weight of the child before labor and so to form some idea of when labor should be induced and what the course of treatment should be. It should be remembered that the average sized child measures 35 cm. fundal measurement, weighs 3,300 grams and has a biparietal diameter of 9.10 cm., and with this as a starting point, the time of induction is easy to reckon for any known pelvis. These figures are based upon my own measurements. My plan is to measure the fetal head and uterine fundus from week to week before labor, and so decide when induction should be done. This should be when the

estimated biparietal is a trifle smaller than the true conjugate.

These methods require some experience and some patience. A combination of the methods gives the best results: he who depends upon one alone will be deluded. The interruption of pregnancy need not be earlier than the amount of contraction requires, and the child need not be exposed to the risk of unnecessary prematurity. It is but seldom advisable to induce labor more than four weeks before term, as then the child would be below the minimum weight, 2,500 grams, for good results. A child of this weight has an average biparietal of 8 cm., the lowermost limit set for induction of labor 8 cm., true conjugate.

Watchful attention and careful measurements in the last weeks of pregnancy avoid the dangers of prolonged pregnancies and large babies, because the size and growth of the child are measured and recognized. Induction may then be done in time. Large babies give more trouble in moderately contracted pelves than does the size of the pelvis. All normal sized babies should be born through a true conjugate of 9.25 cm., equal to the average biparietal diameter, but the big fellows give the trouble. The day will come when a ten-pound baby will become an accusation to the accoucheur instead of a boast to the parents.

The head of a large baby is much firmer, harder, and more difficult to mould than that of a small baby. This alteration in the consistence of the fetal skull of the large child accounts for the trouble he causes even more than does the increase of the diameters of the head. It is the fact that is responsible to a large extent for the success of induction of labor in contracted pelves of moderate degree.

CHAPTER XIII.

DIAGNOSIS OF ECTOPIC PREGNANCY.

Introduction.—The diagnosis of ectopic pregnancy is seldom an easy task and often a difficult one. This is chiefly because of the varied pathological conditions which may exist as a result of the pregnancy and its termination. While the diagnosis is difficult, there is no condition in medicine in which it is more important to have an immediate and exact diagnosis. If it is not recognized, delay may result and treatment for other conditions be instituted.

Delay in the treatment of ectopic pregnancy is dangerous for several reasons. The hemorrhage may continue, adhesions may form and infection of the blood clot result. All of these minimize the patient's chances of recovery. Movement of the patient, particularly jolting or jarring movement, is most dangerous and many deaths have been reported while removing the patient to the hospital in a cab or ambulance.

Mistaken treatment for other conditions, such as curettage for supposed miscarriage, is of great danger in ectopic pregnancy. It causes renewed bleeding and makes operation for the ectopic pregnancy more hazardous.

For these reasons it is important that the diagnosis should be made immediately and exactly. There is considerable difference of opinion in regard to the value of the various symptoms and for this reason I have analyzed 4,000 cases of ectopic pregnancy in the literature with the hope of ascertaining the exact value of each symptom and in this way throwing some light upon the diagnosis. The cases analyzed were all comparatively early ones, before

four months, as advanced ectopic pregnancy offers an entirely different problem. These cases did not all give an expression of all the symptoms, and, in some cases, important ones were omitted; but it has been thought better to give the percentage value of each symptom in a table without reference to the number of times each has occurred.

Amenorrhea	74 per cent.
Uterine hemorrhage	85 "
Average amenorrhea	40 days
Pain severe	66 per cent.
Onset of pain sudden	28 "
Pain and hemorrhage simultaneous	90 "
Symptoms on day of expected menstruation	9 "
Symptoms before the expected menstruation	17 "
Cast of decidua of uterus	3 "
Decidual shreds	16 "
Nausea	33 "
Breast changes	33 "
Pulse 96	33 "
Pulse 100 or over	33 "
Pulse 120 or over	33 "
Temperature above 100	50 "
Hemoglobin almost always between 30 and 70	"
Leukocytes, below 10,000	33 "
" , above 15,000	33 "
" , above 16,000	30 "
Mass palpable from abdomen	28 "
Mass palpable from vagina	88 "
Active bleeding at operation	5 "
Free blood in abdomen	90 "
Fetus found at operation	18 "
Cases in shock at operation	25 "
Average age	25-35 years
Greatest number at	30-33 "
Uterus displaced by tumor	50 per cent.
Vaginal bulging	53 "
Average number of children before ectopic	3.6 "
Number of multiparae	83 "
Mortality after operation in 5,973 cases	7.04 "
Mortality " " " tubal rupture	17 "
Mortality " " " " abortion	1.6 "
Repeated ectopic pregnancy—168 in 4,180 cases in series	4 "
Tubal abortion occurred in	70 "
Tubal rupture " "	30 "

Symtomatology.—In considering the symptoms of ectopic pregnancy it must be remembered that we have to deal with a condition which may take different forms and have varied terminations. First it is a pregnancy and the symptoms of pregnancy are usually present. The women, being mostly multiparae, have been pregnant before and believe they know when they are in the family way. This is of considerable value in the history.

Amenorrhea, a symptom of pregnancy, is one of the most constant signs, being present in three-quarters of all cases. Those cases in which it was not present were in part cases which came to operation before the expected date of the menstruation and cases operated upon before rupture.

The average duration of the amenorrhea was 40 days and in only 10 per cent. of the cases were two periods missed. The cessation of the amenorrhea and the beginning of the uterine hemorrhage usually coincided with the beginning of pain. It is true that in thirty per cent. of cases, there was mild colicky pain before the appearance of hemorrhage and while the pregnancy was intact.

Uterine hemorrhage was present in 85 per cent. of cases, being the most constantly present symptom. Cases in which it was not present were mostly those which had come to operation before the date of the expected menstruation. Hemorrhage came as a rule on the 40th day and continued without intermission. It was continuous in twelve cases to one in which it was interrupted. This fact is of great importance in the diagnosis of ectopic pregnancy.

The character of the uterine bleeding was of a different nature to the usual menstruation and women commonly recognize this fact. It is frequently of the kind known as "spotting" and comes constantly, but in small amounts. It is most frequently altered in consistency and appearance. It is usually dark powdery red in character and

occasionally (16 per cent.) contains "shreds," "pieces of flesh," etc.

The onset of the bleeding usually (90 per cent.) coincides with the onset of pain. This is believed to occur at the time at which intratubal rupture takes place, to terminate later in tubal abortion or extratubal rupture, as the case may be. The ectopic pregnancy does not develop within the mucosa of the tube, but underneath the mucosa and between the muscular coats. The first change is usually bursting through the mucosa to enter the lumen of the tube. When this occurs, there is usually first hemorrhage into the peritoneal cavity from the tube and, at the same time, the uterine decidua is cast off in the form of uterine hemorrhage of the peculiar dark red color. After the decidua is all cast off, the dark red appearance of the uterine hemorrhage disappears.

The onset of symptoms, pain, etc., usually then dates from the termination of the amenorrhea and the beginning of the uterine hemorrhage. This is the time of the first disturbance of the ectopic pregnancy. In five per cent., pain was followed by bleeding, while in five per cent. there was pain and indisposition without bleeding.

The character of the pain was severe in two-thirds of all cases. It was sudden in about one-fourth of all cases. It was in the lower abdomen and usually upon the affected side in about sixty per cent. It was general over the whole abdomen in about thirty per cent.

In about three-quarters of all cases, the severe pain was preceded by pain of less severity, which came on gradually.

The first pains are usually sharp and colicky, while the severe pain following is usually sudden, paroxysmal and cramplike.

This severe pain, which is sudden and unheralded in one-fourth of the cases and preceded by lesser pain in three-fourths, is variously described as "cutting," "knife-like," "cramp-like," etc. It is periodic and paroxysmal, and is followed by syncope in about one-fourth of the cases. It is due to peritoneal irritation from the extravasation of blood from rupture or tubal abortion. It is periodic, because intratubal rupture is associated with repeated small hemorrhages which distend the tube, and the leaking of blood upon the peritoneal surface causes severe pain, similar to that due to any foreign substance as sudden rupture of intraabdominal abscess or secondary hemorrhage. It is paroxysmal in character and similar to pain from intestinal peristalsis in other peritoneal irritations. In extratubal rupture, the blood is extravasated more rapidly, so that the pain is more severe and the shock and collapse more marked. In tubal abortion with more gradual bleeding, the pain is usually more persistent and apt to recur. The return of the paroxysm may occur several times a day and the character of the pain is periodic and crampy at these times.

The first onset of the pelvic pain is associated with shock and syncope in about one-fourth of all cases. In the other cases, there is quite frequently weakness not amounting to fainting or syncope. In about one-half of the cases of syncope, from reports at operation, the shock was of nervous origin due to peritoneal irritation and, in half of the cases, it was due to extensive hemorrhage plus peritoneal irritation. The shock usually occurs once, but in about five per cent. there were repeated attacks.

In about one-third of all cases, there was other evidence of pregnancy besides the cessation of menstruation. Milk, areola of pregnancy or tingling of the nipples is

present in about one-third of cases and nausea, sometimes due to shock, is present in about the same proportion.

With the onset of pain and uterine hemorrhage, there is usually immediate alteration in the pulse rate. It is usually increased and often of the thready character, associated with shock. One-third of the cases have a rate of about 96; one-third 110 or over and one-third 120 or over. So that it may be said that the pulse is usually increased in rate, and usually above 110.

The temperature is usually slightly increased in degree. It is quite often subnormal at the time of the acute pain with symptoms of intra- or extratubal rupture, but soon becomes febrile. In about one-half the cases, it is above 100° and is seldom above 102°.

The hemoglobin is usually decreased in amount. It is seldom higher than 70 per cent. and rarely lower than 30 per cent. The average hemoglobin finding, where it was noted in these cases, was 49 per cent. The white blood count is commonly increased, although this is not constant. In one-third of cases it was below 10,000, in two-thirds above this. In one-third it was above 15,000, and one-third above 16,000 white cells. In the cases of shock, the leukocytosis is usually marked, not from infection but from the previous hemorrhage. The polymorphonuclear cells are usually very high in percentage in shock.

There are sometimes other signs of peritoneal irritation. These take the form of a desire to strain after defecation and a feeling of inability to empty the bowels. Dysuria and frequency of urination also occur. Either one of these symptoms was present in rather more than one-third of all cases.

Examination of the abdomen seldom shows any tenderness before rupture, but after the onset of uterine hemorrhage and pain attending the termination of the pregnancy, tenderness over the lower abdomen is almost invariably present. This is usually more marked on the side where the pregnancy occurs. These symptoms are associated with rigidity, when there is sufficient peritoneal inflammation and irritation from extravasation of blood. If the amount diffused be considerable, there may be some distension of the lower abdomen which may be cone-like. Distension and rigidity may be absent, but tenderness is always present. Tympany is not uncommon in primary intraperitoneal rupture with marked hemorrhage. There may be superficial dulness on percussion over the pubes and in either flank with a resonant note on deeper percussion. A thrill may sometimes occur in the stomach region, although no sign of fluctuation can be felt. On turning the patient over, dulness in the flanks may persist, but gradually disappear in a way which is characteristic of effusion of blood.

On vaginal examination, the mucosa is usually congested, but not to the marked degree of normal pregnancy. The uterus is usually slightly enlarged with a softened cervix, but as a rule none of the bimanual signs of pregnancy, as Hegar's or the author's, are felt. Intermittent contractions, however, are not uncommon. Movement of the uterus usually causes pain. A mass is felt usually on one or other side and behind the uterus. This mass was felt in two-thirds of all cases and was always tender. Pelvic tenderness on examination is one of the most characteristic symptoms of ectopic pregnancy.

If the pregnancy is uninterrupted, the tube usually prolapses into the cul-de-sac of Douglas; if rupture takes place, the blood seeks the lowest place and forms a hematocele in the same situation. The consistency

of the mass is doughy and it can be dented with the examining finger. The situation of the mass and its size is altered by the amount of the extravasated blood and the direction it takes. If the mass is large, the uterus is usually displaced to the normal side. If the uterus is displaced by a doughy tumor which pulsates indistinctly, it is very suspicious of ectopic pregnancy. The mass is usually tense and elastic and often lobulated. This elasticity often distinguishes the condition from the board-like hardness of pelvic abscess.

Anterior or posterior colpotomy has been suggested as a possible means of diagnosis by Bandler. The vaginal vault may be opened over the tumor until the discolored peritoneum covering the blood is seen. The diagnosis may be possibly made in this way without opening the peritoneal cavity, the dark blue shimmer showing through. Puncture of the posterior vaginal vault through a speculum may be done. If the cervix is pulled down and the needle thrust directly in the mid line and close to the cervix, no harm can result and free blood is usually found. Muhsam[1] is a strong advocate of this method and states that in 117 of 124 cases the findings were positive, if not at once, after the woman had been raised to a sitting position. He ascribes the success of treatment at the Moabite Hospital of 108 cases without a death to early diagnosis and prompt operative measures. His greatest dependence in diagnosis is placed in puncture of the pouch of Douglas.

Acetonuria is often present in ectopic pregnancy and is believed to be due to the absorption of products of blood. The same is true of urobilin.

Differential Diagnosis.—The differential diagnosis usually requires some thought. It is of greatest importance to accurately investigate the history, for this will usually differentiate ectopic pregnancy from lesions with similar findings upon vaginal examination. The chief error is in miscarriage. associated with some pelvic mass, as cystic ovary, pus tube, hematosalpinx, etc. This gives the symptoms of pregnancy with the pelvic lesion. Miscarriage with retroversion of the uterus, where the fundus is felt through the posterior vaginal fornix is sometimes very confusing. The carefully taken history, the absence of marked pelvic tenderness, the different feel of the pelvic mass, should differentiate these conditions.

Normal pregnancy in which there is marked asymmetrical development in one cornua of the uterus with marked thinning and softening of the enlarged part, is not infrequently mistaken for ectopic pregnancy. This type of pregnancy is described as similar to a face with a toothache and swollen cheek. It exists within the limits of normal pregnancy, but should be easy to differentiate if the signs of pregnancy, as described in my paper in another issue, are known.

The acute onset of the condition makes it necessary to differentiate it from the acute infections as appendiceal rupture, pelvic abscess, acute gastric ulcer, acute pus tubes and acute appendicitis.

Peritoneal hemorrhage may occur from other sources, such as ovarian hematoma, hematosalpinx, ovarian papilliferous adenocystoma, pachysalpingitis with hemorrhage, etc. In all these cases there may be peritoneal hemorrhage which, however, is not usually associated with marked pain or symptoms of pregnancy.

The diagnosis of ectopic pregnancy is based upon the relation of the history to the physical examination. It is, as my teacher, Charles P. Noble, has often said, not diffi-

[1] Muhsam. *Therapie der Gegenwart*, May, 1913.

cult in 85 per cent. of cases, difficult in 10 per cent. and almost impossible in 5 per cent. With a definite history of a lesion in the pelvis, as shown by pain, tenderness and symptoms referable to the genitalia, with a history of amenorrhea, followed by a continuous slight hemorrhage of a dark powdery red character, different from menstrual blood, with paroxysmal periodic pelvic pain, with an increase in pulse rate, abdominal tenderness and a doughy tender mass beside the uterus, the diagnosis should be exact.

Changes in the uterus, lessened hemoglobin, congestive changes in the breast, distention of the abdomen and alteration in the consistency of the cervix, bring corroborative evidence of value.

A history of missed menstruation, followed by severe pain and uterine hemorrhage of a character different from the menstruation should lead one to suspect ectopic pregnancy.

The most constant symptoms are amenorrhea with a simultaneous onset of uterine hemorrhage and pain. The cases difficult to diagnose are those of long standing, where the hematocele is infected and the diagnosis to be exact should be infected hematocele.

The early diagnosis of ectopic pregnancy is of vast importance in the treatment of the condition. Prompt operative measures cannot be instituted unless diagnosis is early and exact. Care of the patient before operation is also of importance. Many deaths result from careless handling in transportation to the hospital. Operation under a mistaken diagnosis as curettage for supposed abortion is often disastrous. For these reasons, every effort should be made to diagnose ectopic pregnancy early and exactly.

CHAPTER XIV.

LACERATION OF THE PERINEUM AND PRIMARY REPAIR.

Introduction.—As long as women continue to have children, perineal lacerations will continue to occur. Their study is a commonplace one, not associated with the romantic and imaginative associations as are cancer and tuberculosis, but not the less necessary and important. The mere fact of the great prevalence, occurring as they do in half the women who have children, is sufficient to require that the study should be exact and persistent.

The cases reported here were studied at labor and the picture of the laceration drawn upon a stamped outline. This may now be obtained from dealers supplying the medical profession with rubber stamps, and is of great use in the study and record of perineal lacerations. It is a useful record to compare after healing has taken place, and inculcates habits of accuracy in observation. The first historical reference to the subject is found in an early work supposed to have been handed down by tradition and edited by an unknown author who states that Tortula, a midwife attached to the school of Salernum, who lived in the eleventh century, cured a laceration of the perineum by operation—*"Postmodum ruptura intra anum et vulvam tribus locis vel quatuor suimus cum filo de serico."*[1]

Ambrose Paré[2] was another of the early investigators of the subject and is credited with having performed the operation. He reports a cure of two cases, but does not state that the operation was done immediately after labor. He gives directions as follows: "But if through the violence of extraction the genital parts are torn, so that the two cavities, the rectum and vagina,

are torn in one, the tear must be stitched up, and the wound cured according to art. I have thus cured two women living in Paris."

Various other investigators followed Paré, amongst them his pupil, Guillemeau,[2] who operated upon one case of complete rupture of the perineum six weeks after labor. He pared the edges of the old cicatrix and used one figure-of-eight and two interrupted sutures. The operation was a success. Others who performed the operation for complete tear were De La Motte, Morlarme, Saucerotte, Noël, and Dupuytren in France, Rowley in England, and Oslander and Dieffenbach in Germany. Dieffenbach[4] wrote extensively upon the subject of complete perineal tear and followed the plan of making lateral incisions at each side of the perineum after suturing the recto-vaginal septum. In 1837 he advised the primary repair of all lacerations of the perineum, including first and second degree tears.

Amongst American surgeons Mettauer[5] of Virginia published a report of a successful operation for complete tear six months after its occurrence. He used sutures of lead and fastened them by twisting.

Roux[6] wrote extensively upon the subject and published many successful cases of complete perineorrhaphy. He was an earnest advocate of the operation.

Amongst those who did primary operations for incomplete tears of the perineum were Bayer[8] in 1823, Churchill[9] in 1824, and Williams[10] in 1827, while Alcock[11] performed the intermediate operation for incomplete laceration in 1820.

The secondary operation for laceration of the second degree tears also was first done about this time. Fricke,[12] in 1835, has done the operation four times with three successes. Nick[14] also reported in 1838 that he had done two operations for incomplete tear of the perineum. Baker Brown[15] was, however, the surgeon who did most to bring the operation into general use and encouraged others to study the subject of perineal injuries. In 1866, Baker Brown had done 112 operations upon the perineum. His work stimulated Savage[16] to excellent researches upon the anatomy of the perineum, which have remained classic in gynecological literature.

Following after these were Hegar, Sims, Agnew, Emmet, A. Martin, and Lawson Tait. Of these, Emmet[17] has been the greatest contributor toward the subject and recognized that the torn muscles and fasciae caused a loss of support to the pelvic floor. His operation is the one commonly performed at the present time.

Since the time of these masters, a multitude of new operations have been devised to restore the anatomical support of the pelvic floor and close the perineal wound, caused by descent of the head at labor. All these operations have as their aim the intimate approximation of the edges of the torn fasciae and muscles. To this end, in secondary operations, many forms of denudation of the vaginal mucous membrane have been exploited. The majority of these attempt the excision of the scar tissue of the old wound and the restoration of the torn muscles and fasciae.

Without a proper appreciation of the causes, processes, and forms of perineal rupture, it is useless to attempt to judge the value of each modification of the various operations. With this end in view I have made sketches of forty-eight consecutive perineal lacerations at the time of labor and have noted the most evident and directly causative factors. These lacerations oc-

curred in 100 women, of whom 90 were primiparae. This gives a percentage of occurrence of forty-eight per cent., which is within Williams' estimate of 45 to 58 per cent. Every wound of the mucous membrane other than a small tear of the fourchette has been reckoned in the series, none over 1.5 c. m. in length have been excluded.

Causes.—The various causes of perineal laceration are usually cited as follows: 1. Too rapid expulsion of the child, so that tearing of the perineum instead of stretching results; 2. Relative disproportion between the presenting part and the parturient outlet; 3. A faulty mechanism of labor whereby the largest circumference of the head passes the perineal ring; 4. The use of forceps.

Rapidity of delivery is without doubt the most frequent cause of perineal laceration. This is particularly seen in those cases of precipitate delivery where the head comes through the birth canal rapidly and impinges upon the perineum with almost the force of a blow. This rapidity of advancement of the head is sometimes seen in cases of contracted pelvis, where strong uterine pains are required to force the head through the bony pelvis, with the result that the less resistance of the soft parts does not retard its way. The quick descent of the head was also seen in one case (No. 25), where the membranes had remained intact until the head had come through the brim; when the membranes ruptured, the head was advanced with great rapidity, causing a laceration in a multipara with a comparatively lax outlet.

The passing of the head through the perineal outlet should undoubtedly be retarded, until the parts have softened and stretched. A preliminary digital stretching is most useful in primiparae, although often a painful procedure. It can, however, be done during the labor pains and is a means of stimulation of their force and frequency.

A frequent cause of perineal laceration is the pressure of the head upon the perineal body and the lack of retraction between pains. The maternal parts become bloodless and tense and tear readily with further descent of the head. An additional factor in the production of this condition is the attempt to control expulsion by pressing the taut perineum against the sinciput. This wounds the perineum and aids in the production of the anemic condition. The advancement of the head should be controlled without making any pressure upon the perineum.

Strong pains are a definite factor in the production of perineal injuries, but may be readily controlled by chloroform.

Relative disproportion between the presenting part and the parturient outlet is commonly thought to be one of the main causes of perineal injuries.

In any attempt to estimate the size of the fetal head in relation to the perineum, it should be decided which is the greatest diameter of the fetal head to engage in the perineal ring. In this study, it will be considered to be the occipito-frontal diameter, which comes into relation with the perineum by the final extension of the head. It is the diameter most capable of accurate measurement and gives a more dependable estimate of the size of the fetal head than do the suboccipito-bregmatic or biparietal diameters. The various circumferences of the fetal head offer too much possibility of error in measurement to make them useful as indications.

Therefore, in attempting to estimate the size of the presenting part in its relation to the size of the perineal ring, the greatest engaging diameter, the occipito-frontal, is taken as a criterion. However, as the size of the head increases in direct proportion to the weight of the child, the increase of weight in its relation to perineal lacerations is also considered. This increase in the size of the fetal head in proportion to the weight was shown to be constant in 100 cases studied in its relation to intra-uterine cephalimetry.[19]

Varieties.—In this series, the 48 perineal lacerations may be divided into two classes: 1. Those not involving the muscle; and 2. Those involving the muscle of the perineum. Of those not involving the muscle, there were 21. The average weight of the 21 babies was 3,310 grammes, and the average occipito-frontal diameter was 11.27 cm. The 27 cases of lacerations involving the muscle had children averaging 3,550 grammes, and with an average occipito-frontal diameter of 11.75 cm. The average weight of 100 babies, of whom these 48 cases here reported are a part, was 3,300 grammes, and the average occipito-frontal diameter was 11.40 cm. Therefore the result may be summarized:

	O. F. Diam.	Weight.
21 cases of laceration not involving muscle	11.27	3,310 gm.
27 cases of laceration involving muscle	11.75	3,550 gm.
100 cases, including 48 cases of laceration	11.40	3,300 gm.

From this summary it will be seen that the babies causing lacerations not involving the skin were of average weight, but of less than average size of head; while those causing lacerations involving muscle were of more than average weight and size of head. However, the slight increase in weight of two hundred grammes (7 oz.) can hardly explain the causation of the lacerations in view of the fact that the heads were but slightly larger than average. Nor will the fact that, in 21 cases of minor lacerations, the fetus was of average weight and less than average size of head explain the causation of these tears.

The causation of perineal lacerations, while undoubtedly influenced by considerable increase in size of the fetal head, does not depend to any extent upon this condition. It must, therefore, depend more upon the size and condition of the perineum itself than upon the size of the fetus and fetal head. The disproportion may be due to firmness of fiber and rigidity of perineal structure.

Faulty mechanism of labor is undoubtedly the cause of a small percentage of lacerations, but this has an influence in but a small number of cases. Amongst them are those cases where the occiput does not present under the symphysis as in delivery by face to pubes. Whenever the flexion of the head is not sufficient, a larger diameter than necessary must pass the perineal ring. If flexion is good, the occiput may pass under the pubic bones before the occipito-frontal diameter engages in the outlet.

In breech deliveries the reverse must ensue, i. e., the occiput remain within the ring and pivot under the symphysis, allowing the sinciput to engage first in the ring.

The use of forceps as a causative force is one which varies very much with the methods of different operators. The harm they cause depends upon: 1. The kind of forceps employed; and 2. Upon whether the operator delivers the head with the forceps or not.

Forceps with long blades of the type of the Simpson forceps may cause laceration of the perineum in two ways. First, directly on a backward pull by the breadth between the shanks where they join the handles, which unduly stretches and wounds the outlet at a level with its greatest frailty, the posterior fourchette. Second, the blades themselves do not closely approximate the fetal head, and the edge of the blade extending beyond the head, impinges upon the vaginal floor and is forced into the tissue. This condition is quite common when attempts are made to deliver the head through the ring without removing the forceps. When the handles of the forceps are turned upward in order to extend the head, the blades, not fitting snugly over the head but grasping the parietal processes firmly, turn upon these eminences as upon a pivot, with the result that the point of the blade extends beyond the head and impinges upon the pelvic floor. Further descent of the head drives the point into the tissue and starts a laceration. In such conditions it requires but a small beginning of a tear in the mucous membrane to result in a large laceration.

The secret of success in the prevention of perineal lacerations is to keep the mucous membrane intact: once the mucous membrane is ruptured, as by the point of the forceps' blade, the head stretching these tissues often causes a severe tear, while, if the mucous membrane is kept intact, delivery is often made successfully through most rigid perinea. In other words, the tissues are like cotton, in which, if a tear is once begun, it may be easily extended. Such was the result in one case (No. 7), here reported, where a small laceration was caused by the points of the Elliott forceps and the muscles split so that the finger could be thrust between the muscular planes to the skin of the ischiorectal space.

It is necessary in delivery to prevent the parturient from slipping away from the hand protecting the perineum during delivery. The diameter of the fetal head from the brow to the back of the neck should be brought into the median line. The right hand restrains the sinciput or forehead; while the left index and middle fingers are worked into the angle below the symphysis and lift the back of the head until the back of the neck enters the symphygeal angle. The soft parts are pushed backward over the dip of the occiput in order that the occiput may be delivered before the sinciput and the head escape delivery in the longest diameter, the occiput frontal. As soon as the head is under control the patient should be instructed to count rapidly or to take deep rapid breaths in order to eliminate further straining. If chloroform is given, the straining may be controlled in this way. The occiput must be delivered before extension of the head is allowed.

Stretching the perineum is always advisable before forceps operation. Sometimes this may be done by dilatation of the vagina by a rubber bag as first advised by Macomber. This is so painful as not to be permitted until an anesthetic is given, but manual dilatation by massage and stretching is useful before operative deliveries.

It should be remembered that the essential part of the perineum is composed of fascia and muscle and that fascia will not stretch, while muscle will. The fold of skin and superficial fascia extends for 3 or 4 cm. beyond the musculature below. For this reason, in order to avoid laceration into the muscle, where a laceration must ob-

viously occur, an incision or episiotomy may be made for 2 cm. or a thumb's breadth into perineum without cutting into muscle.

This allows of enough enlargement of the outlet and is more readily repaired than is a perineal tear. The incision should be made backward and downward and at the side below the outlet of the vulvovaginal gland. This is a useful procedure, not sufficiently used. It was known centuries ago and referred to by Harvey, discoverer of the circulation of the blood and by De La Motte who was a close observer of perineal injuries. It may be very readily repaired with No. 2 chromic gut. v. Ott has done 364 episiotomies and is most laudatory of the operation.

The secret of avoidance of tears in forceps delivery is the use of proper forceps and the removal of the forceps as soon as the head can be controlled by the hand.

Trials by practical use of many models show that semi-fenestrated forceps as described in a previous chapter, fit the head well, cause little traumatism to the vagina and perineum, and are easily applied without causing abrasions or injury. These forceps may be applied and the head drawn down until it can be controlled by pressure upon the forehead between the coccyx and the anus. No attempt should be made to deliver the head without first removing the forceps.

With the acquirement of skill and the use of proper forceps, there is no reason why there should be more lacerations directly due to forceps in instrumental deliveries than in non-instrumental deliveries. The head may be delivered as slowly and as much care taken of the perineum as in non-instrumental deliveries.

A frequent cause of perineal laceration which is often credited to the forceps operation is the traumatism done by the prolonged stay of the head at the outlet and the pressure caused by the ineffectual labor pains pressing the presenting part against the pelvic diaphragm. In those cases (Nos. 19, 30 and 38) in which the head had remained some time upon the pelvic floor, the resulting lacerations were extensive and deep; the tissues were edematous and fragile, being repaired with difficulty, as the sutures cut out. The presenting head should not be allowed to remain upon the perineum without advance for more than an hour and a half, and usually not that time.

Posterior positions are also often spoken of as a cause of perineal lacerations and undoubtedly predispose to this condition. Forceps rotation is dangerous with the old style long fenestrated forceps. The vaginal mucous membrane may be stripped off, as was the result in one case (No. 32), reported here. However, with the modern solid blade model, the operation of rotation by forceps is easy, and there is but little danger of damage to the mucous membrane.

Scar tissue in the perineal ring as a result of old wounds or previous perineorrhaphies makes the perineum more easily torn. The fibrous scar tissue has not the elasticity of normal perineal structure, and rupture is apt to occur at this spot. In several cases of multiparae (Nos. 5, 8 and 39), the perineal outlet was of fair size, yet a laceration occurred at the site of the scar.

It is frequently stated that the shoulders in head presentations often cause lacerations of the perineum. Such is not my experience. The shoulders alone seldom originate a laceration; but large shoulders quite frequently increase the extent of a tear which was begun by the head. The

phenomenon already referred to holds good that a tear once begun readily extends; such was the result in one case (No. 18) in this series.

For the purpose of consideration of these lacerations, they may be divided into tears of the anterior and posterior part of the perineal outlet. The posterior tears may again be divided into:—1. Tears not involving the muscle, or minor tears; 2. Tears involving the muscle, or major tears; and 3. Tears involving the sphincter.

The relation of the skin surface to the lacerations has no bearing upon its depth or gravity. Ofttimes a laceration may not involve the skin surface, yet extend deep into the muscle of the pelvic floor. Such cases are Nos. 7, 24, 27 and 36. There may be extensive injury to the pelvic muscular support without any rupture of skin surface.

Minor lacerations occurred 21 times. Forceps were done 4 times. The average weight of the babies, as before stated, was 3,310 grammes.

Major lacerations occurred 27 times. There were 11 forceps deliveries. The average weight of the babies was 3,550 grammes.

No cases of sphincter tear occurred in this series. The author has repaired a number of sphincter lacerations in obstetrical work and has had two occur in his own hands. One of these was due to an ill-directed and ill-controlled forceps traction when the head was near the perineum. The head came down suddenly with the last traction, and as the direction of the traction was wrong, ruptured the perineum. The other case was one in which, while an assistant delivered a case of placenta previa under my direction, the arms became extended in the breech extraction and caused delay, so that the safety of the child compelled extraction of the head very hurriedly. The head came through the pelvis so quickly that the extension of the face was not done. The chin caught against the perineum and caused a sphincter laceration. Both of these tears should have been prevented. Most sphincter lacerations are without excuse, and, with proper care, should not occur.

TABLE OF CASES.

No.	Para.	Pelvis.	Occ. Fr.	Weight.	Remarks.
1	I	Normal	12.75	3600	
2	I	"	12	3500	
3	I	"	11	3300	Precipitate. Age 39.
4	I	"	11.25	3400	
5	II	sl. contr.	11.5	2900	Scar of old operation caused rigidity.
6	III	" "	11.75	3900	
7	I	Normal	11.75	3450	Med. forceps. Muscle split begun by sharp edge of forceps.
8	II	"	12	3950	Old scar tissue.
9	I	Contracted	11.5	3050	High forceps; torn after removal.
10	I	"	11.75	4000	High forceps, dry labor.
11	I	"	11.25	2850	
12	I	Normal	11.25	3100	Low forceps.
13	I	"	11.25	3650	
14	I	"	10.50	2950	
15	I	"	11.25	3400	
16	I	sl. contr.	10.75	2800	
17	I	Normal	11.25	3600	
18	I	sl. contr.	11.50	3700	Tear increased by large shoulders.
19	I	Normal	11.75	3800	R. O. P. Head on perineum 1½ hours, tissues contused.
20	I	"	12	3750	
21	I	"	11.75	3600	Low forceps.
22	I	"	12	3500	
23	I	"	11.5	3025	
24	I	"	11	2950	Second degree. Skin intact.
25	II	"	10.75	3200	R. O. P. Head came down quickly when membranes ruptured.
26	I	"	11	3200	
27	I	"	10.5	3100	R. O. P. Second degree.
28	III	Contracted	12.25	3800	Med. forceps.
29	I	Normal	11.5	3650	Low forceps.
30	I	sl. contr.	10.75	3000	Low forceps. Head on perineum 1½ hours.
31	I	Normal	11.25	3500	
32	I	"	11.25	3300	Med. forceps. L. O. P. Caused by attempts at rotation.
33	I	"	11.25	3100	R. O. P. Low forceps. Age 44.
34	I	"	10.30	3500	Very rigid.
35	I	"	11	2650	
36	I	sl. contr.	10.75	2900	
37	II	Normal	11.5	3800	Med. forceps. Dry labor.
38	I	"	11	2650	Low forceps. Head on perineum 1½ hours.
39	II	"	11.50	3800	Low forceps. Old scar of previous repair.
40	I	"	11.25	3500	Med. forceps.
41	I	"	12	3300	
42	1	"	11.75	3200	
43	I	"	11.50	3400	Med. forceps.
44	I	"	11.50	3500	
45	I	sl. contr.	11.25	3400	
46	I	Normal	11.25	3000	
47	I	"	11	3000	
48	I	"	11.25	3200	

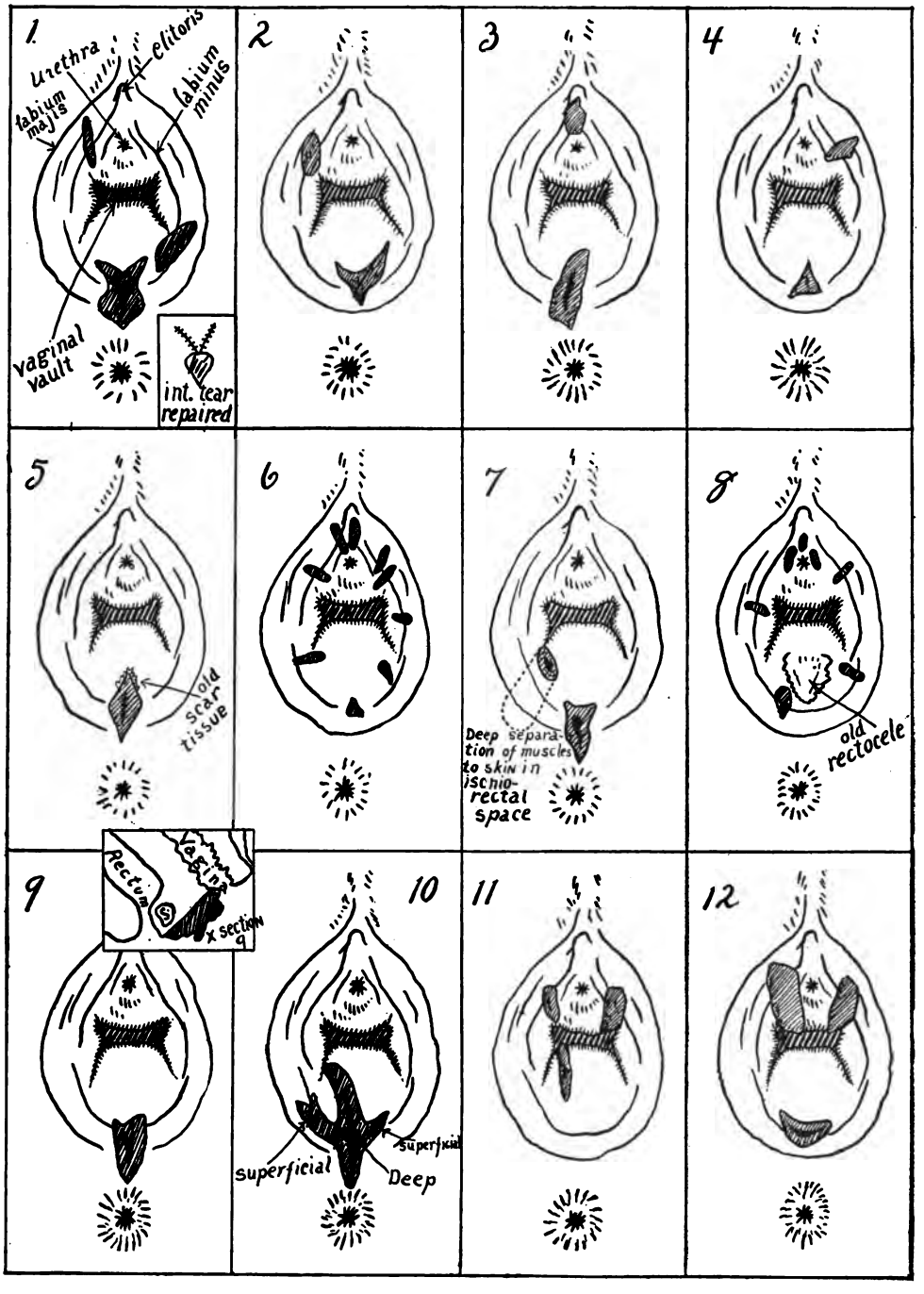
1
Urethra
Clitoris
labium majus
labium minus
vaginal vault
int. tear repaired
2
3
4
5
old scar tissue
6
7
Deep separation of muscles to skin in ischio-rectal space
8
old rectocele
9
Rectum
Vagina
S
x section 9
10
superficial
Deep
superficial
11
12

FIG. 1.

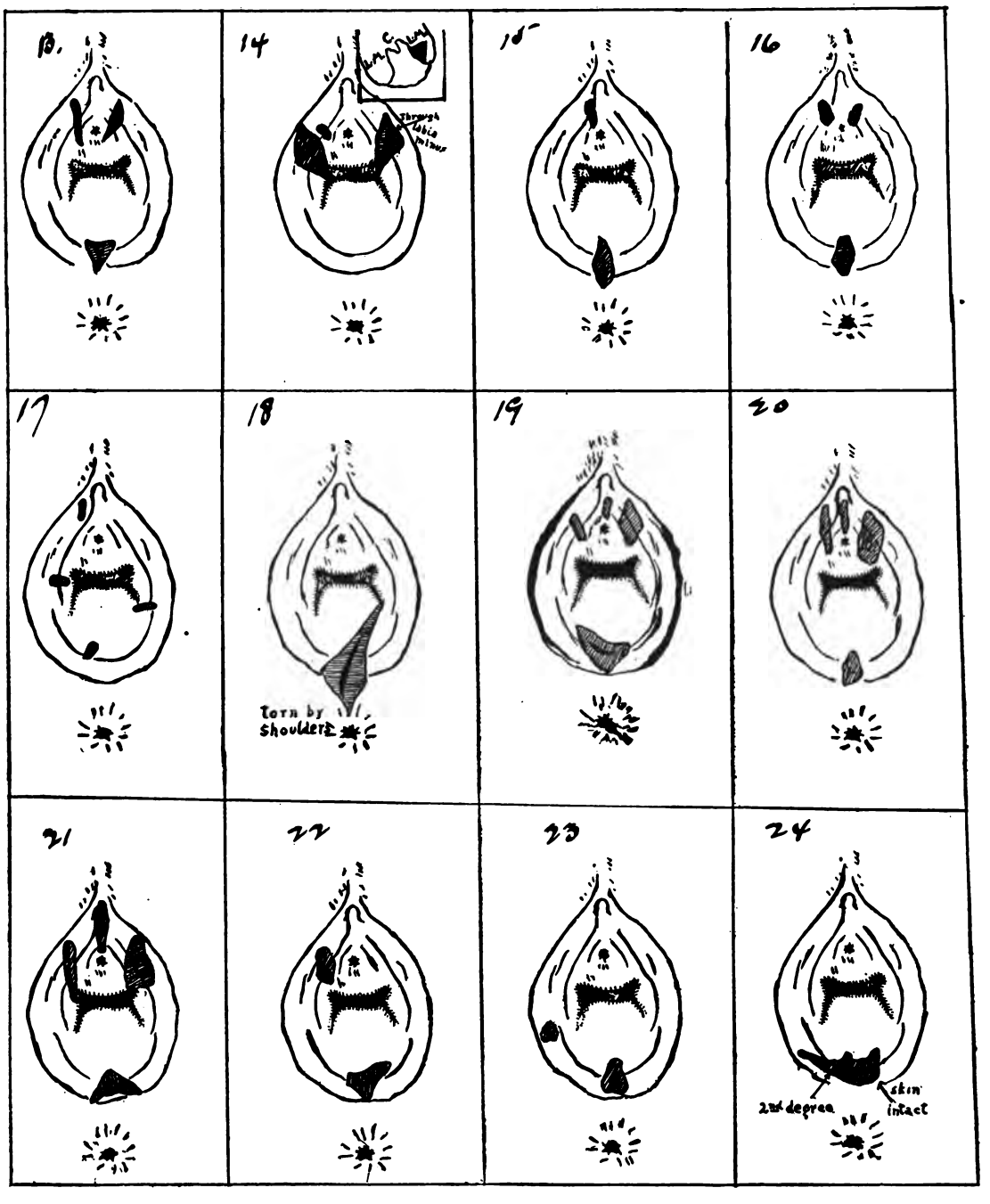
13.
14
15
16
17
18
Torn by shoulders
19
20
21
22
23
24
2nd degree
skin intact

FIG. 2.

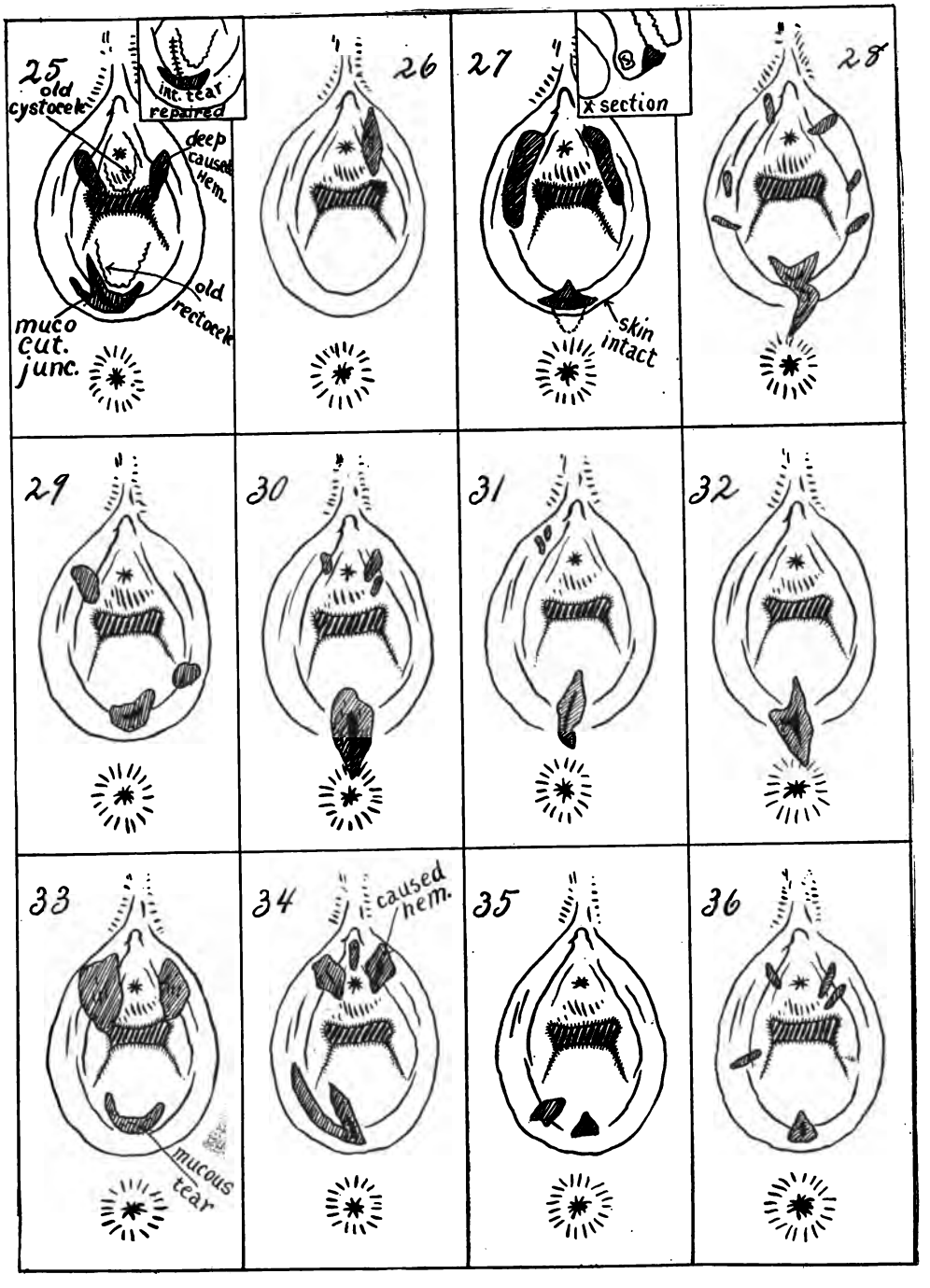
25
old cystocele
int. tear repaired
deep caused Hem.
old rectocele
muco cut. junc.
26
27
X section
skin intact
28
29
30
31
32
33
mucous tear
34
caused hem.
35
36

FIG. 3.

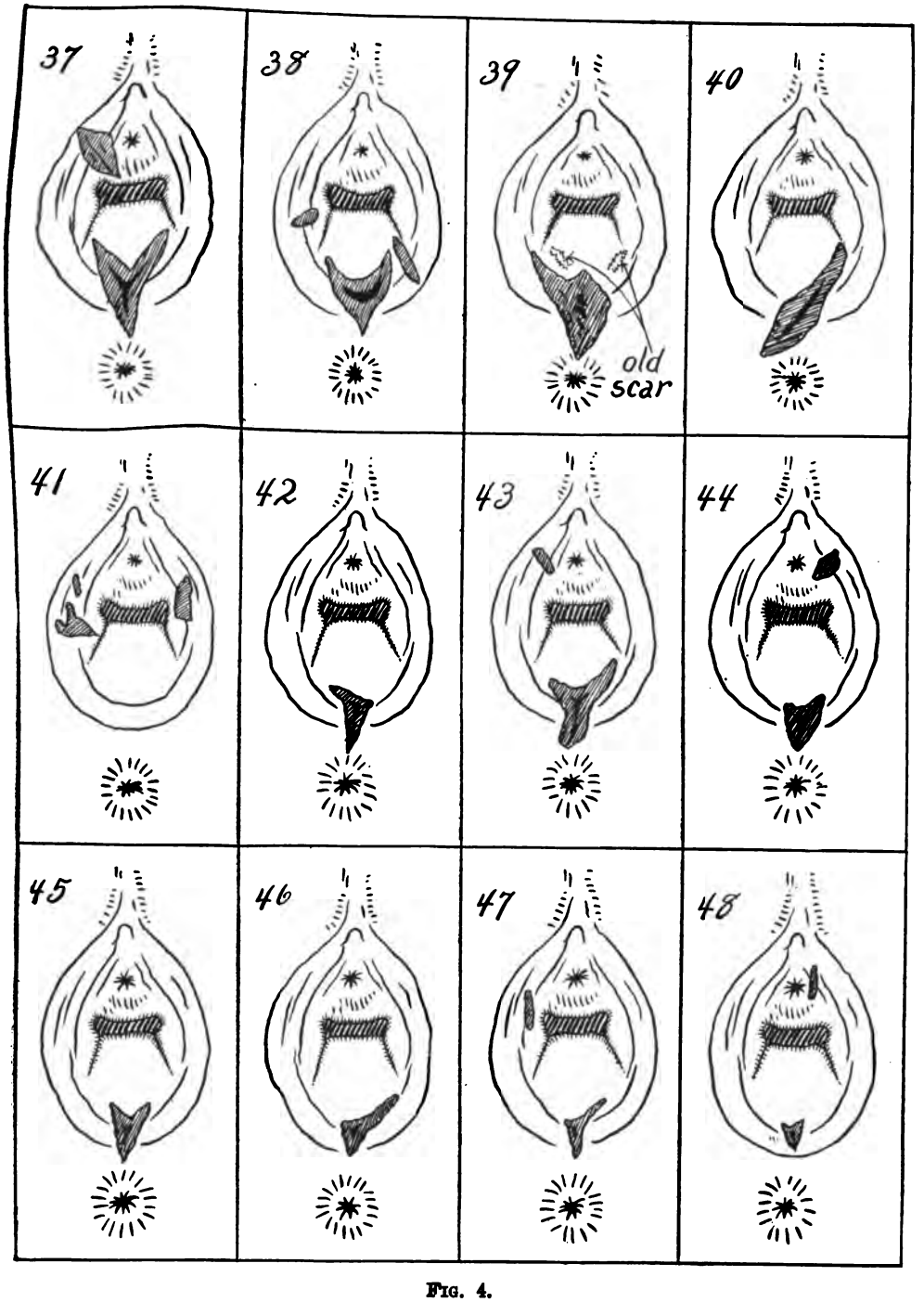

FIG. 4.

In consideration of these 48 cases, it will be seen that lacerations of the anterior portion of the perineal ring have occurred 32 times. These lacerations occurred in the region of the vestibule, through the labia minora and around the urethral orifice. They frequently caused hemorrhage. In one case (No. 14) the labium minus was

A scrutiny of the more severe [illegible] this series will show that the laceration[s] are usually lateral. Those which occurre[d] in the midline did not extend centrally in the vagina, but deviate to one or other side [to] separate to form a V. The only lacerations which extended centrally in the vagina were those in which the perineum was [illegible]

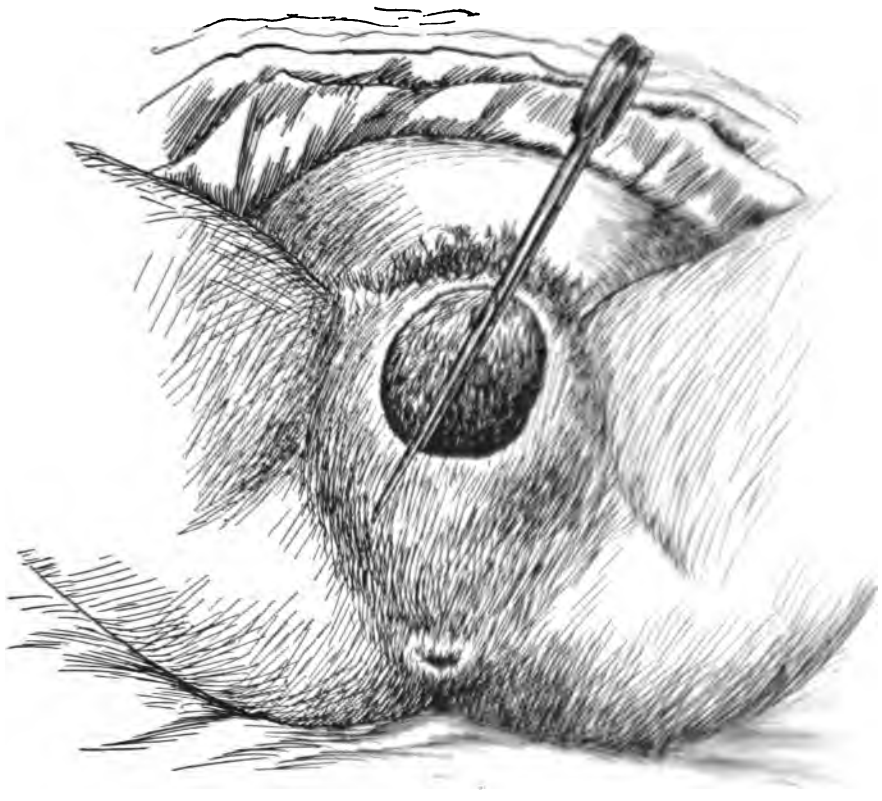

Fig. 6

torn completely through, as if cut with scissors. These anterior tears have but seldom been referred to save by Bar and Hirst and are of considerable importance, as they often bleed profusely. A death from hemorrhage from an anterior lacera tion has been referred to by Mathews Duncan.

[illegible]

by Noble, best completes the exact anatomic restoration for primary repair. It may be modified to suit any of the more severe lacerations shown in these pictures.

These lacerations were all repaired immediately after labor. The operation may be delayed 24 to 28 hours, if the woman's condition is poor, but should not be delayed longer, as the pyogenic organisms, constantly in the lochia, may cause infection of the wound. If it is necessary to delay longer, the laceration should be left for complete cicatrization, and a secondary operation done. The intermediate operation in the stage of granulation is one fraught with danger. Freshening the granulating surfaces of an infected wound of the perineum may cause a severe intoxication and open avenues of infection.

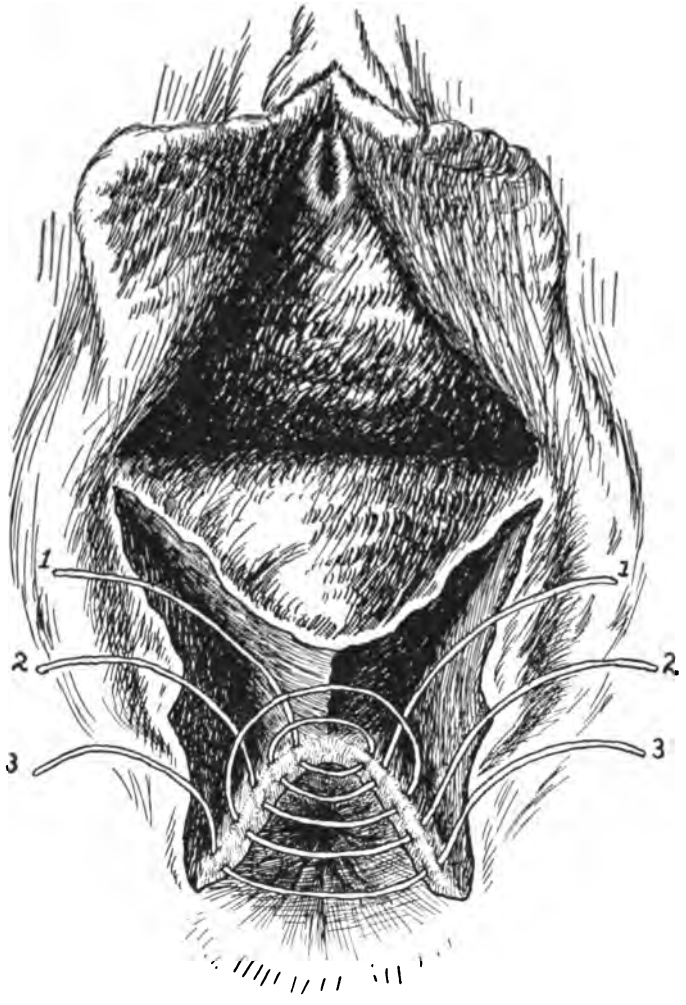

FIG. 6.

The technique of the operation for primary repair was as follows: First, if there was a sphincter tear, the rectum was sutured by a modified Lauenstein suture with fine chromic catgut and a small needle. These sutures pass in and out close to the margin of the gut upon the vaginal side without

penetrating the rectal mucosa. [illegible]
introduced in a figure-of-eight and [illegible]
overtightly. The remainder of the [illegible]
tion, save for joining the sphincter e[illegible]
the same as for a sphinter or major [illegible]

The mucous membrane is suture[illegible]
No. 2 chromic catgut, with a Kelly's nee[illegible]
These needles should be rather hea[illegible]
useful type, with a large (Lister's) eye [illegible]

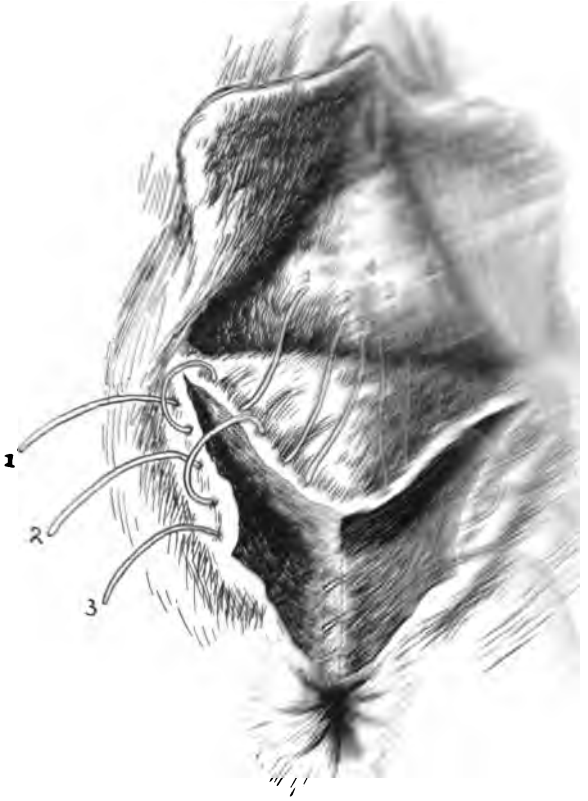

FIG. 7. ILLUSTRATING [illegible]

the side, is that sold by Codman and [illegible]
leff of Boston. The needle should be [illegible]
serted 1 cm. from the edge of the [illegible]
membrane and come out at the [illegible]
the laceration; be reinserted [illegible]
cm. from the opposite edge [illegible]
bites of tissue should be taken. [illegible]
here are also passed at [illegible]

The next step in the operation is the closure of the external or skin surface of the laceration: this is done by silkworm or chromic gut sutures, with the Kelly needle. The sutures, as passed through one side of the wound, come out at the bottom and, if necessary, pick up any redundant tissue, and are reinserted to come out about 1 cm. from the skin surface. These sutures are drawn sufficiently tight to bring the edges of the wound firmly together. It usually requires from three to five of these sutures. None should be tied until all are in place, the effect of each suture upon the wound by crossing the ends of the suture being to pull the edges of the wound together. When all are inserted, these sutures are tied.

Attention is then directed to the muco-cutaneous junction at the level of the hymen. Here two or three fine chromic sutures are usually required to effectually seal the wound.

The secret of success and primary union in this operation is to have no opening or gap in the line of the wound for the entrance of the lochial discharges which have been proved always to contain pyogenic organisms. These last chromic gut stitches effectually block a very commonly left gap

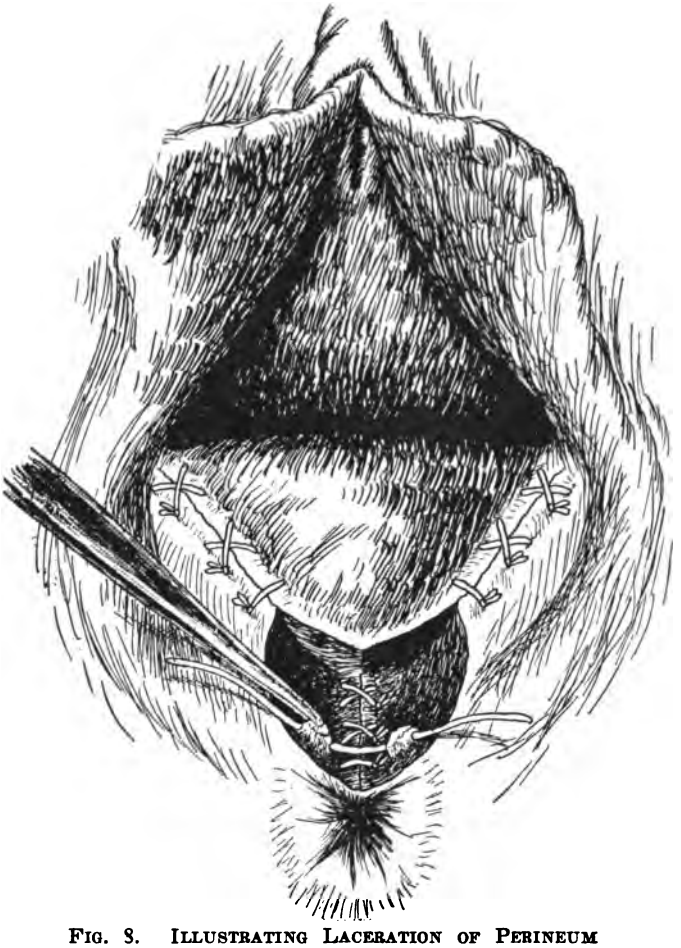

FIG. 8. ILLUSTRATING LACERATION OF PERINEUM

which would permit the infiltrating discharge to obtain entrance to the lower part of the wound. These stitches correspond to the "crown-stitch" of Emmet's operation and restore the fascia in that plane as well as add to the cosmetic result.

are not so succulent, nor are they so exposed to discharges, as to require chromic gut. The difficulty in the repair of these anterior tears is to avoid puckering and to get a straight line of union. This is best done by beginning the continuous suture

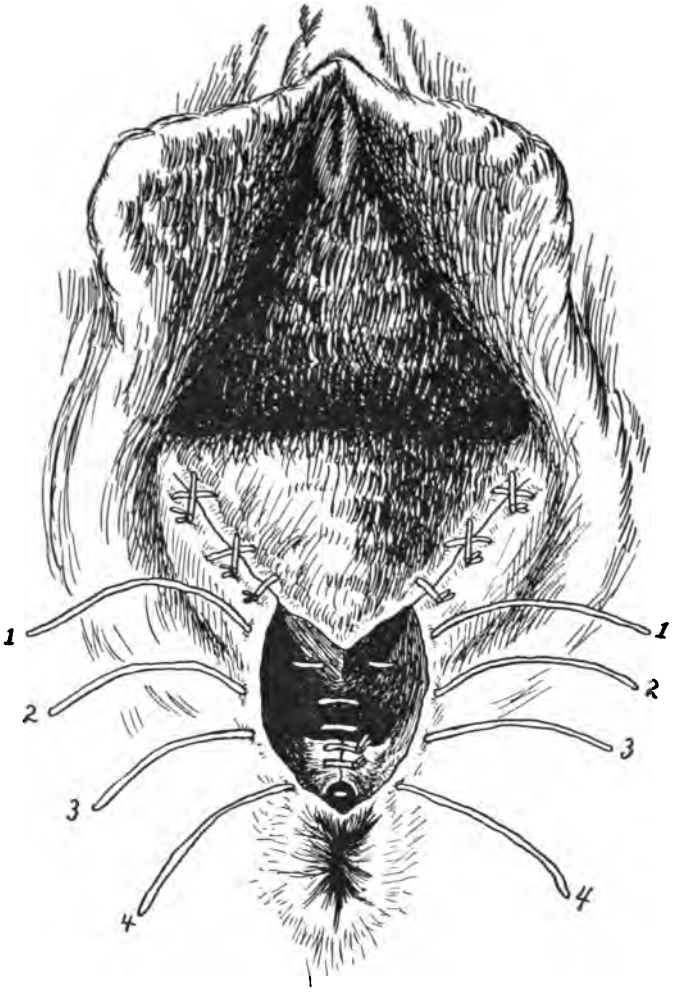

FIG. 9. ILLUSTRATING LACERATION OF PERINEUM (CHAPTER 14).

The operation is done in three steps: 1. Suturing the mucous membrane; 2. Suturing the external tear; and 3. The "crown-stitches."

The anterior lacerations were all repaired with fine plain catgut. The tissues here

at one end of the tear and tying it. This tied end is used as a tractor and the suture continued as a "half-hitch" suture, i. e., after every bite of the needle the catgut is passed underneath the last stitch, as the tops of flourbags or bales are sewn. The

[illegible] continued to the end, leaving [illegible] wound.

Of these cases healed up by primary intention, in which plain catgut was used

The aftercare consisted in keeping the women in bed for ten days. No douches were given, except on other indications. The silkworm gut sutures were removed in

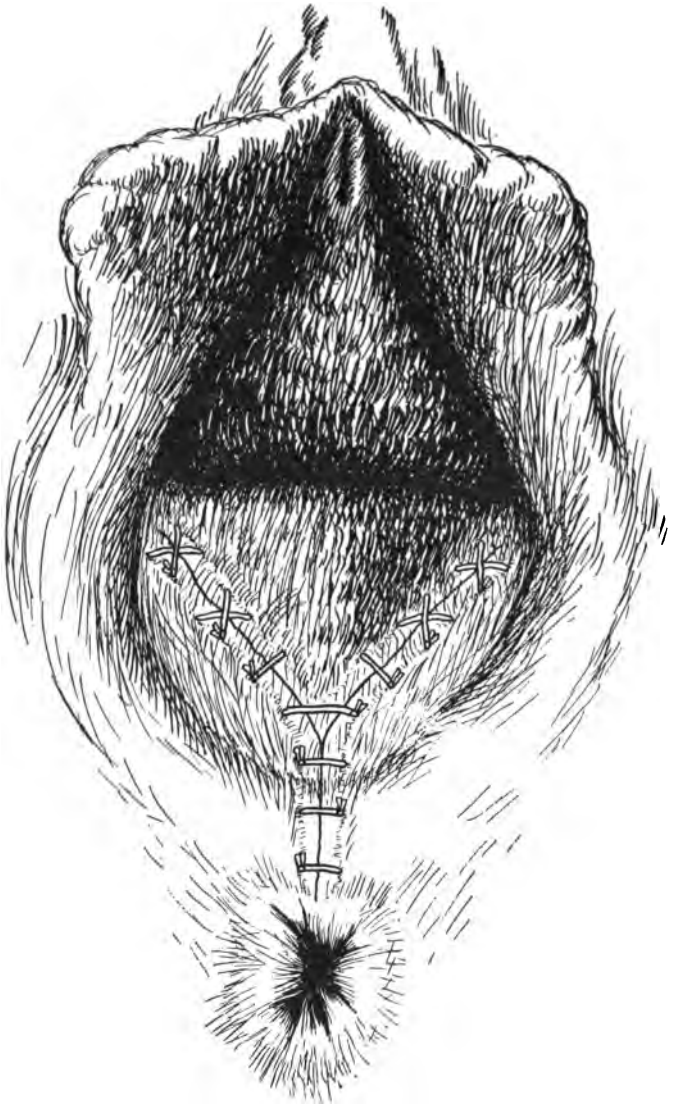

FIG. 10. ILLUSTRATING LACERATION OF PERINEUM (CHAPTER 14).

had some separation and infection of the vaginal part of the wound. The sphincter tears, sutured by this method, and with fine chromic gut buried in the sphincter muscle, healed perfectly.

from ten to fourteen days, as the condition of the wound demanded. The women were often allowed up after ten days with the sutures in place, and about the house a day or so before their removal.

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CHAPTER XV.

PREVENTION OF CATHETER CYSTITIS IN THE FEMALE.

Introduction.—The use of the catheter is as old as the Pyramids. The remains of surgical instruments in some of the recent Egyptian excavations included among them bone instruments for the catheterization of the female urethra. It is probable that since that time, except for surgical cleanliness, there has been but little improvement in the technique of catheterization. The catheter is still thrust in as if the bladder were a cyst which must be punctured with a trocar. The nurse grasps the instrument with a firm grip, prepared to stab the patient if she moves or attempts to escape. After several ineffectual jabs and thrusts, the catheter is thrust half way in and the operator stands up in triumph to allow the congested blood to escape from her head and brushes her hair out of her eyes. In some hospitals, the technique varies. In one, the nurse was required to wash her hands as for a surgical operation, then to put on rubber gloves and gown. She must then take bichloride and five gauze wipes and rub one

over each labia (being four labia and one over the meatus, then with her gloves well contaminated and the parts well irritated by the bichloride, she thrusts in the catheter.

The production of catheter cystitis depends upon injury to the tissues, particularly to the mucous membranes in the neighborhood of the neck of the bladder and the sphincter muscle of the bladder [illegible] urethra. Injury to the lower part of the trigone is particularly prone to produce bladder irritation.

It is well known that, in operations which involve external trauma to the bladder, such as complete hysterectomy, there is a very marked tendency toward cystitis. This is most frequent in operations which involve extensive dissection, such as cancer operations. There is, as a rule, a greater difficulty in urinating when morphine and atropin have been used.

After labor also, there is sometimes difficulty in urinating. This is more frequent after forceps operations, and when the anterior vulvar parts have been injured or torn.

The mere presence of microorganisms in the urine is no reason for cystitis, as it often happens that the urine contains pus-forming organisms without any infection. Injection of cultures of bacteria will not produce cystitis unless trauma is present.

This trauma usually comes from the introduction of the catheter. It may be that there is in addition injury from the operation to the walls, nerves and circulation of the bladder. The injury of the catheter is often the precipitating factor.

This injury to the urethra and trigone comes in several ways. First, from improper catheters, either too small or too large. The too large [illegible] injury from difficulty [illegible] ing. The very [illegible] because its [illegible] and diff[illegible] usual[illegible]

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[illegible] drive [illegible] [illegible] injures the [illegible] to this, [illegible] side are not good [illegible] drawn off, the [illegible] bladder is drawn into the eyelet and may be injured. This is particularly true, when the bladder is lax and the urine flows off faster than the bladder contracts. It sometimes shows its effect upon the flow of the urine when the "stammering" or "stuttering" of the bladder results from the mucosa filling the eyelet and being suddenly pulled away by bladder contractions. The flow of urine comes intermittently.

Then again catheters of firm material as glass do not adapt themselves to the shape of the urethra and so put the parts on stretch and cause trauma. The urethra is a fairly regular curve with the concavity upwards and most glass catheters are straight with a beak or nose. They cannot accommodate themselves to the urethra.

To overcome these defects, I use a rubber catheter 15 or 16 French which has a hole in the end or an apical aperture. The catheter will not distend the urethra unduly and need not be inserted into the bladder.

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FIG. 1.

a movable piece of rubber tubing
fits closely over the catheter. The
instructed to measure the urethra at
first catheterization. This is done by
ing the rubber catheter in until the
flows freely. It is then gradually
drawn until the urine ceases to run
then slowly reinserted until the flow
again. This point is measured on the
of the catheter at the level of the
minora.

If catheter cystitis or trigonitis should occur, the sooner treatment is instituted, the easier it is to cure. The injection of a mild silver preparation is usually all that is necessary. A one-fourth of one per cent. nitrate of silver freshly prepared with 20 per cent. glycerine in distilled water may be used. Nitrate of silver is less irritating, provided the viscosity of the solution is greater than water. The thicker the solution of nitrate of silver, the slower the action and the less irritating the effect. For this reason glycerine and other substances are used. Silver nitrate is the most reliable of the silver preparations, provided it is freshly prepared. The lack of irritation of most of the newer silver salts and preparations depends upon their greater viscosity, slow action, and weakness of effect upon the tissue.

Treatment should be begun at the first
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just as necessary as in the anus, where the passage is no longer.

A useful lubricant for this purpose may be made by boiling Irish moss in water. Three ounces of Irish moss should be taken and washed in running water for a half hour. It should then be placed in two pints of water in a saucepan and allowed to boil over a rather slow fire, while constantly stirred. If it is not stirred, it had better be put into a double boiler, otherwise it will stick to the bottom of the saucepan. After this has boiled for ten minutes, it should be taken off and passed through a fine wire strainer, such as is used in kitchens. If it does not flow readily through the strainer, it may be expressed by means of rubbing a large spoon against the meshes of the wire. This strained jelly is again put upon the stove and sterilized by boiling for one-half hour with sufficient water added to make it of the consistency of jelly. After one-half hour of boiling, the jelly is taken from the stove and poured into lead paint tubes which have been previously boiled with their stoppers in another vessel. Before the jelly is poured into the tubes, it is my custom to add to it an antiseptic, such as eucalyptol or thymol. This is to preserve the jelly.

This lubricating jelly is useful for examinations in the office. If it is desired to make the jelly clear and transparent, it is better to add a large quantity of water, filter through muslin or asbestos fibre, and later evaporate to the requisite consistency. However, this is not necessary. The jelly is cheap and costs about 5 cents a quart. Irish moss is commonly used in this country by brewers—to lubricate throats, probably. The jelly may be put into lead paint tubes, which may be obtained from any can manufactory, or into small wide-mouthed glass bottles. The receptacles must, of course, be sterilized before using. Enough may be made at once to last throughout the year. Various proprietary preparations under euphonious names may be obtained; most of them are made from Irish moss or chrondrus. Oil, olive or paraffin, makes a good lubricant, but has the disadvantage of attacking rubber.

The lubrication must be applied to the catheter and to the urethra. The hands are washed and the left forefinger takes up some lubricant. This is roughly spread over the area of the meatus, coating its parts here fairly freely. This has the advantage of making a coating over the mucous membrane, so that, if the catheter does miss the meatus, it touches the lubricant. No gauze wipes or cotton sponges are used. It is impossible to wipe microorganisms out of the urethra, because the discharges are only driven further in.

The catheter is taken in the right hand which remains clean and well lubricated with the Irish moss jelly. The labia are held apart by the thumb and forefinger of the left hand which rests, palm downward, on the symphysis.

The catheter is then inserted about 1.5 cm., a finger's breadth, and held there with gentle pressure. The patient is then asked to take as long a breath as it is possible for her to take. This relaxes the sphincter and the catheter slips in without trauma.

After the insertion of the catheter for the first 1.5 cm., the sphincter immediately goes into reflex spasm and, if the catheter is forced in, the spasm becomes firmer and firmer. It is necessary, therefore, for the patient to turn her attention to the contraction of some other antagonistic set of muscles, the contraction of which releases the involuntary reflex spasm of the sphincter of the bladder and allows the catheter to slip in almost of itself. It is very easy and very simple and is based upon the same principle as swallowing the stomach tube or bearing down in the passage of the rectal tube—relaxation of the sphincter.

The catheter may then be withdrawn until it can just draw off the urine and not enter the bladder, as is shown in the draw-

ing of the catheter with the special aperture.

When the bladder contracts during the withdrawal of urine by the catheter, there is a simultaneous continuous movement which begins slowly and increases in speed toward the end of micturition. The longitudinal diameter, however, decreases more and quicker, than the horizontal. The more powerful longitudinal muscles would appear to contract more quickly and more strongly, than the circular fibres. The result of this is that, if a catheter is inserted too far, as the lateral-holed catheter must be, the bladder wall strikes it, before the urine is all out of the bladder. The apical-orificed catheter avoids this.

To prevent the necessity of catheterization, Frank[1] has recommended the injection of 15 to 20 c. c. of glycerin, which he calls a laxative for the bladder. This is injected, when urination is required. This is effective in some cases, but it causes some irritation and pain, as does glycerine on any mucous surface, rectum or urethra. Waldstein[2] uses bougies of glycerine 90 per cent. and neutral soap 9 per cent. for the same purpose. Both cause a little irritation.

An injection of sterilized paraffin oil is sometimes effective in retention. It is harmless and may be injected before catheterization. The syringe should be a blunt-nosed one and placed against the meatus and, while the patient takes long breaths to relax the sphincter, gentle pressure is made. In this way, some of the oil enters the bladder and a catheter is unnecessary. The glycerine injections sometimes cause too much irritation.

[1] Frank: *Zentralbl. f. Chirurgie*, 1909 xxxviii, 2.

[2] Waldstein: *Gynaekol. Rundschau*, 1911, Vol. 1.

If catheter cystitis or trigonitis should occur, the sooner treatment is instituted, the easier it is to cure. The injection of a mild silver preparation is usually all that is necessary. A one-fourth of one per cent. nitrate of silver freshly prepared with 20 per cent. glycerine in distilled water may be used. Nitrate of silver is less irritating, provided the viscosity of the solution is greater than water. The thicker the solution of nitrate of silver, the slower the action and the less irritating the effect. For this reason glycerine and other substances are used. Silver nitrate is the most reliable of the silver preparations, provided it is freshly prepared. The lack of irritation of most of the newer silver salts and preparations depends upon their greater viscosity, slow action, and weakness of effect upon the tissue.

Treatment should be begun at the first signs of pain and pus in the urine. If the nitrate of silver-glycerine solution is not immediately effective, bladder washing may be added.

But the real secret of the abolition of catheter cystitis is its prevention. This is best done by a proper instrument with an aperture in the end which allows the urine to be drawn without the catheter entering the bladder. The catheter should be lubricated. The sphincter of the bladder should be relaxed before the catheter passes it, so that irritation and burning of the mucosa does not occur. This is best done by asking the patient to take a very long breath while the catheter is about a finger's breadth in the meatus. This allows the sphincter to relax and the catheter to slip into the bladder. In this way trauma is prevented, and without trauma catheter cystitis does not occur.

CHAPTER XVI.

PLACENTA PREVIA.

Introduction.—Placenta previa is one of the most dangerous complications of pregnancy. Its danger to the child is not less than its risk to the mother. More than half of all the children die at birth, and many survive in a weakened condition.

The frequency of placenta previa is variously estimated. From reports of clinics collected by me for two years in 183,389 labors, placenta previa was found once in 160 labors. Clinics, however, have more than their proportion of these cases and the ratio of occurrence in private practice is probably less.

Etiology.—The etiology of placenta previa is obscure. One known fact is that it is much more frequent in multiparae. My statistics show one primipara to nine multiparae. The more children the greater likelihood of placenta previa. The rapidity with which the labors occur also increases the probability of this complication. It has been suggested that changes in the uterine wall from atrophy or inflammation as a result of frequent or repeated pregnancies predispose toward placenta previa. Such conditions limit the amount of blood going to the placenta and cause it to spread over a larger area in order to get nourishment. This is borne out by the common occurrence of large surface and thinness of the placenta in this condition. The placenta spreads down and overlaps the internal os and so forms placenta previa. The mucosa of the isthmus and cervix responds less actively than that of the fundus to the decidual reaction, so that placenta is required to be thin and expanded. The decidual reaction, similar to that of tubal pregnancy, causes villi to grow deeply into the muscular bundles of the isthmus at cervix, often to penetrate almost completely the thickness of the wall.

The mucosa of the isthmus in contrast to that of the cervix shares in a most characteristic way in the decidual reaction, although the decidual swelling is only one-third of that of the body of the uterus. On the other hand, the isthmus more resembles the cervix in its muscular tissue and is, by passive stretching, more concerned in the course of pregnancy in the enlargement of the ovisac and is thus transformed into the lower uterine segment. The isthmus normally affords nourishment for the membranes; but, in placenta previa, the implantation seriously affects the condition of the wall. The embedding of the placenta has a destructive effect penetrating the thin decidua into the muscular layer in such fashion as to injure the wall of the isthmus, reducing its elasticity and contractile power.

The uterine wall thus thinned is easily torn and, having lost much of its elasticity, hemorrhage is common both before and after separation of the placenta. The placenta may be so adherent as to be separated with difficulty and with marked loss of blood. The cervical tissue is readily lacerated owing to its increased vascularity and the deep implantation of the villi.

This destructive action of the placental villi is more marked when the seat of the ovum extends into the cavity of the cervix and the ovum roots itself on the muscular tissue there. The process of thinning and weakening of the lower segment of the uterus explains the proneness to laceration.

It is possible that placenta previa may be formed by fusion of the decidua reflexea

and vera over the internal os; but this is probably the exceptional mode of formation, and a low implantation with cleavage of the decidua vera and obliteration of the os the common one.

Mortality.—A collection of cases treated in the last twenty years and during the antiseptic era gives 8,888 cases with 7.4 per cent. maternal mortality and 55 per cent. fetal deaths, considering all classes of placenta previa. Complete placenta previa had a maternal mortality of 16 per cent. and a fetal mortality of 72 per cent. In incomplete (partial or lateral) placenta previa, there was a maternal mortality of 5 per cent. and a fetal mortality of 60 per cent. Incomplete placenta previa occurs three times as frequently as does complete. A consideration of these statistics shows that complete placenta previa is three times more fatal to the mothers than is incomplete, and that approximately two-thirds of all children will die, although complete is also more dangerous to them. The apparent discrepancy in the fetal mortality percentage of the incomplete form, being greater than the combined, is due to the fact that all reports are not divided into these classes as may be seen in my detailed paper referred to in the footnote.[1]

A comparison with the results obtained in preantiseptic days shows a considerable drop in the maternal mortality (23.6 per cent. to 7.4 per cent.); but little or none in the fetal mortality (63 per cent. to 55 per cent.).

Many children die soon after birth in proportion to the degree of their prematurity. Mason and Williams state that, of 114 children born alive, 38 per cent. died within a few days. Of the children born alive at full term, 20 per cent. died afterwards; of children born alive at 8 months, 48 per cent., and of children born alive at 7 months, 71 per cent. died within a few days of delivery; and, as only 36 per cent. of all their children were born alive, it will be seen that the mortality of children is considerably increased after delivery. Zweifel in 178 cases of placenta previa, found that 78 children were born alive and of those weighing less than 2,500 gm. (5½ pounds) only nine left the clinic alive, and of those weighing more than that amount, 39 left the clinic alive, i. e., 41 per cent. of those born alive dying within a few days. Couvelaire also shows that the expectation of life depends upon the maturity of the child; thus of 17 infants weighing less than four and a half pounds only two survived, whereas of 19 weighing more than six and a half pounds, ten survived.

It may be seen from these reports that the chances of life of the child are very precarious, not only from the dangers of maternal hemorrhage, malnutrition, accidents of delivery; but also from the danger of dying after delivery from prematurity, weakness and exhaustion. The danger of death to the child is increased in direct proportion to its smallness of size and prematurity.

Complications.—Hemorrhage and its results are the chief danger in placenta previa. This bleeding usually occurs some time before full term and comes on as a dribbling of blood without pain. It quite often occurs at night and the woman is awakened by a feeling of warmth at the vulvar parts. The first hemorrhage is not usually a severe one and is but seldom associated with straining

[1] These statistics have been detailed at length in *Surgery, Gynecology and Obstetrics*, June, 1911, pp. 546-561, and there has been added thereto Cragin's report of 223 cases. *Am. Jour. of Obstetrics*, July, 1911.

or effort. The patient does not as a rule go into labor immediately following the hemorrhage. Of Füth's 726 cases treated by midwives, only 25 per cent. had pain immediately succeeding the hemorrhage and in the remaining 75 per cent. an interval of days, weeks or months occurred. All but three of the women applied for medical aid before delivery on account of the hemorrhage. Only 3 per cent. of the 726 women had no hemorrhage before labor pains occurred.

The first bleeding usually terminates spontaneously and leaves the woman but little weakened. However a second one is not long in coming and often there is a persistent dribbling, so very weakening to the patient. The second and succeeding hemorrhages are more likely to follow upon straining or effort. In placenta previa, approximately 70 per cent. of all deaths are due directly to hemorrhage and exhaustion, and the weakness and lack of resistance following the bleeding is indirectly responsible for many who died from infection, air embolism, shock, uterine rupture, and other causes. In Füth's series, there were 141 deaths, of which 98 died from hemorrhage and a large percentage of the rest from infection due to lessened resistance. The great danger is hemorrhage before, during and after labor, and treatment must be directed against it.

During labor, the natural straining with labor pains is one of the main dangers in increasing the bleeding. The hemorrhage will continue after the cervix has been stretched or dilated until the placenta is removed or pressure brought to bear upon the cervical vessels. The cervical vessels do not pass through the uterine contractile tissue but go directly to the cervix from the uterine artery and vein.

Postpartum hemorrhage also occurs in about 12 per cent. of all cases based upon recent series. This is more common in complete placenta previa and is probably due to the weakening and destruction of the cervical wall due to the imbedding of the placenta in that part. Hemorrhage after delivery often comes on at an interval after the birth of the baby. The delivery of the child causes an immediate fall in the blood pressure of the mother, but this fall is soon recovered and, when the pressure returns to its former level, the postpartum hemorrhage occurs.

In cases of postpartum hemorrhage, the placenta is often adherent to its site and requires to be brought away by manual extraction. This is frequently followed by a renewed rush of blood. In four of Warren's 14 cases of postpartum hemorrhage in this condition, the placenta was adherent, although there was no hemorrhage after delivery in two other cases of adherent placenta.

There is also danger of persistent and severe hemorrhage from cervical lacerations. These occur readily owing to the weakened condition of the cervical wall, its excessive vascularity, and softness. Often the laceration extends so high that it cannot readily be sutured, and packing is not of avail. The bleeding is often only dribbling in character, but may be free and severe.

Postpartum hemorrhage may occur in placenta previa treated by Caesarean section if the cervix has been dilated by labor pains previous to operation and, while the advisability of Caesarean section is doubtful in any case, it is positively contraindicated where there has been cervical dilatation and hemorrhage.

Laceration of the cervix is the most common injury in placenta previa. It is most usually due to delivery of the head after version through a cervix which is not fully dilated. The friability of the cervix from placental erosion causes laceration to occur with readiness. It sometimes extends to become a uterine rupture and cause severe hemorrhage. Hauch in 240 cases found a considerable laceration in 11 with two deaths from hemorrhage.

Laceration may also be caused by manual dilatation of the cervix by Bonnaire's method followed by version and extraction. Of 171 cases reported by Bonnaire after this method, the cervix was lacerated in 20, in 5 the tear extended into the uterus and in 2 involved the vaginal wall. Of the patients with lacerations, 6 died. Laceration may also occur from the elastic rubber bag or hystereurynter, introduced into the cervix to stop hemorrhage. Of 144 cases treated by the elastic bag by Hauch, there were 9 lacerations and in the majority of these a weight of two pounds had been attached to the bag to hasten dilatation. In cases where the bag is inserted without any weight, laceration is not so common. The weight was only attached to the bag in those cases where there was considerable hemorrhage or where the bag did not completely control the bleeding.

Laceration of the cervix may also occur from the tearing out of the volsella forceps applied to the cervical lip for traction in inserting an elastic bag or in packing the cervix with gauze.

Abnormal position of the fetus is a not uncommon complication of placenta previa. The situation of the placenta, occupying as it does the space which should be occupied by the child's head, forces the head to be elsewhere. Müller in his statistics found 272 transverse and 107 breech positions of 1,148 cases. There was thus abnormal position in one-third (33 per cent.) of all cases. This malposition is, however, not always a detriment for it makes version easier, as the child is half turned already with the head out of the false pelvis.

The placenta is often adherent and this is the case more often in complete placenta previa on account of the more extensive infiltration of the cervical walls. In 160 cases in which this complication was noted, there was adhesion to a greater or less degree in 67 cases (42 per cent.). The placenta frequently requires manual extraction, even when broken into fragments by thrusting the hand through it to do version and breech extraction.

Plural pregnancy is more common in placenta previa than in the ordinary run of cases. Winckel states that, in his experience, twins are four times as common in this condition as customarily. Warren found twins twice in 94 labors where the usual ratio is 1 to 80 labors. In these cases, the twins are usually weak.

Diagnosis.—Hemorrhage is usually the first sign of placenta previa and comes on as a rule without straining or excessive effort. It rarely appears before the seventh month; but is more frequent during the last month of pregnancy. This hemorrhage as a rule comes before the labor begins; in about 75 per cent. of cases, there is an interval between the first hemorrhage and labor. Very few cases have no bleeding at all before labor pains begin. This first bleeding usually terminates spontaneously.

Examination of the woman at this time usually shows a cervix which is dilated

sufficiently to insert a finger and feel within the cervix the roughened outside surface of the placenta covering the os. The abrupt margin of the placenta may sometimes be felt through the abdominal wall above the symphysis and at the posterior vaginal fornix the rear margin may be palpated by the examining finger.

When the cervix will not admit one finger, the placenta may be felt between the fetal head and the finger as a soft intervening cushion. Attempts to produce ballottement drive this cushion against the head. The cervix is usually shorter and softer than in normal pregnancy. Manipulations of the cervix produce bleeding easily. It should be remembered that malposition is associated with placenta previa in approximately one-third of all cases. When the placenta is inserted in the cervix the lip of the os protrudes and the cervix ballooning often resembles an abortion impacted in the cervix. Sometimes the cervix is friable, but if it is open, crumbling masses may be felt, which will usually bleed at touch.

Treatment.—The treatment of placenta previa must be considered in general and then as to the various types of the disease.

The indications to be met are the control of hemorrhage and the delivery of the child without traumatism, mutilation, or delay.

In no condition in obstetrics is delay so dangerous to mother and child as in placenta previa. Delivery should follow the first hemorrhage. The only exception to this rule is where the patient can be put to bed in a hospital and carefully watched. Delay is then permissible as long as the pulse is below 100, and the mother and child in good condition. Delay is, even then, not without danger, but often the intense desire for a live child will excuse the chances taken.

The improvement in results comes not so much from any method of treatment as from early delivery, and early delivery is as advantageous to the child as to the mother. Delivery should immediately follow upon complete dilatation of the cervix, but delivery should be without traumatism.

The danger of hemorrhage is increased by strong internal contractions and the probability of cervical laceration is much increased. The ideal course in placenta previa is dilatation of the cervix with mild labor pains and little natural straining. For this reason if pains are strong, particularly if an elastic bag is inserted, it is usually well to control them by a hypodermic of morphine, gr. ⅙ to ¼, and atropin, gr. $^1/_{100}$. Atropin is a useful uterine sedative and has a distinct effect in preventing severe contractions. As long as the membranes are unruptured, the greatest safety of the mother lies in prohibiting strong pains or straining.

If hemorrhage is severe, hypodermoclysis or venous transfusion should be done. It should be remembered that normal saline solution does not consist of one dram of sodium chloride to a pint of water; but other salt should also be included. Evil results have been reported from using sodium chloride alone. A useful formula is as follows: Sodium chloride 9.0 gm., calcium chloride 0.1 gm.; potassium chloride 0.25 gm. to one liter of water.

The choice of anesthetic is of considerable importance. Anesthesia is not as a rule required for the insertion of the elastic bag; but when version and extraction or other operations must be done, anesthesia is necessary. Chloroform should be given with great care in the presence of hemorrhage, particularly if that hemorrhage is sudden. I have come to fear it greatly in placenta previa and always substitute ether

where possible. The pregnant woman does not bear ether as well as chloroform; they are apt to be troubled with mucus and bronchial irritation, possibly due to laryngeal congestion.

Still the danger of sudden collapse and shock is so great in placenta previa that ether should be the anesthetic of choice.

It is important to hasten to arrest the hemorrhage and then deliver the woman without haste and without force. Because it is important to hasten to arrest the hemorrhage, it does not follow that delivery should be hastened.

In considering the treatment of complete placenta previa, it should be remembered that we have to do with a disease which under the best clinic auspices kills one in six of the mothers and about three out of four babies. The greatest danger to both mother and child is from hemorrhage and to it must the treatment be directed. The chances of saving a child are so small that the mother's risk must not be increased on that account. Delay in delivery after the first hemorrhage but weakens the child and increases the maternal risk.

The child is premature in 60 per cent. of all cases and death after a few days occurs in from 15 to 71 per cent. of all babies, depending upon the degree of prematurity, so that the chances of life for the child are not great in complete placenta previa.

The danger from hemorrhage is not only from collapse after one or two hemorrhages, but from sudden shock after repeated small hemorrhages. All surgeons know how little resistance those patients have, who suffer from repeated hemorrhages as from uterine fibroids, and placenta previa cases are no exception to the rule.

For these reasons then, the indication for treatment of complete placenta previa is immediate stoppage of the hemorrhage with little consideration for the life of the child.

When the cervix is fully dilated, the indication is clear. Immediate delivery of the child controls the hemorrhage and offers the child the best chance of life. Delivery may then be done by Braxton-Hicks' version and immediate breech extraction. This should be done carefully and slowly so as not to cause any mutilation of the cervix or perineum.

It is usually well, if condition of the patient allows, to dilate the vagina and stretch the perineum with the hand. This makes the difficulty of breech extraction much less. If the placenta completely covers the dilated cervix, it is better, when thrusting the fingers into the uterus to do the bimanual version, to attempt to pass two fingers around the anterior lobe of the placenta under the symphysis rather than through the centre of the placenta. The risk to the child is increased by piercing of the placenta by thrusting the hand through the centre and, as the geometric centre of the placenta hardly ever coincides with the centre of the cervix, two fingers can usually be passed around, and they are sufficient to do the bimanual version. In case the edge of the placenta cannot be passed, the obstetrician can always fall back upon piercing the placenta although after this procedure hardly a single child survives, so it is useless to try to hasten the extraction of such a child.

Extraction should immediately follow version only when the os is fully dilated or nearly so, because of the danger of cervical lacerations and uterine rupture.

When in central or complete placenta previa, the os is undilated, immediate control

sufficiently to insert a finger and feel within the cervix the roughened outside surface of the placenta covering the os. The abrupt margin of the placenta may sometimes be felt through the abdominal wall above the symphysis and at the posterior vaginal fornix the rear margin may be palpated by the examining finger.

When the cervix will not admit one finger, the placenta may be felt between the fetal head and the finger as a soft intervening cushion. Attempts to produce ballottement drive this cushion against the head. The cervix is usually shorter and softer than in normal pregnancy. Manipulations of the cervix produce bleeding easily. It should be remembered that malposition is associated with placenta previa in approximately one-third of all cases. When the placenta is inserted in the cervix the lip of the os protrudes and the cervix ballooning often resembles an abortion impacted in the cervix. Sometimes the cervix is friable, but if it is open, crumbling masses may be felt, which will usually bleed at touch.

Treatment.—The treatment of placenta previa must be considered in general and then as to the various types of the disease.

The indications to be met are the control of hemorrhage and the delivery of the child without traumatism, mutilation, or delay.

In no condition in obstetrics is delay so dangerous to mother and child as in placenta previa. Delivery should follow the first hemorrhage. The only exception to this rule is where the patient can be put to bed in a hospital and carefully watched. Delay is then permissible as long as the pulse is below 100, and the mother and child in good condition. Delay is, even then, not without danger, but often the intense desire for a live child will excuse the chances taken.

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of the hemorrhage is more difficult. The amount of the dilatation of the cervix is not sufficient to allow the passage of the fetal head and the bleeding must be controlled until the proper dilatation is obtained. This control of hemorrhage may be obtained in one of three ways: (1) by Braxton-Hicks' version, bringing down one foot so that the fetal body acts as a tampon and delayed extraction; (2) by the use of the inflatable elastic bag of Champetier de Ribes; or (3) by tamponage of the cervix with gauze.

If the child is dead or premature, version with delayed extraction answers well. It usually sacrifices the child, but in most cases controls bleeding. If the cervix is half dilated, version with delayed extraction is commonly successful, because the cervix is usually soft and the half breech causes dilatation within a short time.

If, however, the child is alive and the os small or not readily dilatable, the choice of treatment must be among the three, with the preference to the elastic bag, where possible.

The elastic bag or hysteurynter gives good results, provided certain conditions are observed. First the operator must be skillful in its use and observe all antiseptic precautions. The danger of infection is said to be increased but, in 246 cases treated by the inflatable bag, Hannes found only 0.9 per cent. mortality from infection; so that it is evident that in good hands the mortality from infection is even less than in other forms of treatment. Second, the bag must be introduced within the ovum. If the bag is placed outside the membranes, the maternal mortality is very much greater, as is shown by the report of Hauch of 96 cases, in which the bag was introduced outside the ovum with a mortality of 15.6 per cent., and of 48 cases in which the bag was introduced within the ovum with a mortality of 2.1 per cent.

In cases where the placenta does not completely cover the half dilatated os, the introduction of the bag within the membranes is comparatively easy; but when the placenta completely covers the os and the bag cannot be passed around the anterior lobe, it becomes a question whether it is better to pierce the placenta with the bag or to do a bimanual version by the insertion of two fingers aided by outside manipulations with delayed extraction of the child after the foot had been pulled down.

The choice between these two methods under such circumstances will depend upon the condition of the mother and the child. The bag treatment improves the chances of the child; but if the child is dead or premature, this does not have weight. A premature child, being small with a soft cranium, is not so likely to tear the cervix. If the mother is in great weakness from hemorrhage, delayed extraction after version will probably stop the hemorrhage more quickly, as, with the bag after the os is dilated, delivery must still be effected.

Altogether the rule may be laid down that, when the os is partially dilated with a live child, the bag treatment offers the best results when it can be introduced into the ovum and when urgent symptoms are not present. In 387 cases where the bag alone was used and introduced into the ovum where possible, the maternal mortality was 5 per cent. The most successful of this number was Hannes' 143 cases treated by the bag alone with no deaths from hemorrhage, although there were 8 deaths from other causes, as previous infection, eclampsia, etc. The hystereurynter reduces the mortality of the children from 70 per cent. to 30 per cent. according to figures col-

lected from these series. The greater hope of life that the elastic bag or hystereurynter gives the fetus may be judged from Thies' report of the results from Bumm's clinic. Taking all births into consideration, the fetal mortality was as follows: spontaneous delivery, 20 per cent.; vaginal gauze plugging, 33 per cent.; combined version with slow extraction, 80 per cent.; combined version with rapid extraction, 64 per cent.; vaginal Caesarean section, 50 per cent.; hystereurynter or elastic bag, 14 per cent.

Combined version with delayed extraction is very fatal to the child and should be restricted as much as possible to urgent cases where the mother's condition demands immediate control of the hemorrhage. If the interest of the mother alone is to be considered, Braxton-Hicks' version and delayed extraction remain the safest method if the cervix is partially dilated.

There are certain necessities for successful treatment by the hystereurynter. The bag must be of large size, as big as a normally large fetal head. It should measure 10 to 12 cm. in diameter and contain from 500 to 600 cm. (about 20 oz.). The bag treatment in this country has achieved a bad reputation because the small de Ribes bag, intended for induction of labor, has been used and inserted outside the ovum.

The bag should be inserted within the membranes with a special forceps for the purpose, and with antiseptic precautions. The bag may be boiled and kept ready for use in glycerine which will preserve it, as rubber is apt to crack and spoil if kept dry. It may be boiled with the glycerine in a large preserve jar and the jar wrapped in a sterile towel ready for use.

The bag remains in position for 3 to 5 hours as a rule. If the control of the hemorrhage is good, no weight need be attached; but, if the bleeding is not perfectly stopped, a 2 lb. weight may be attached on a cord running over a pulley, as in fracture extension, on the end of the bed. If the weight is attached, a stout elastic band should intervene between the bag and the cord of the weight. In this way, sudden pull on the uterus, caused by the patient drawing away from the weight, is avoided and the danger of cervical laceration is lessened. The weight should only be attached to those cases where there is considerable hemorrhage or labor is unduly prolonged. After the use of dilating bags, the operator should be necessarily cautious in doing version and breech extraction, as there is danger of uterine rupture.

The advantage of the bag is that compression is applied directly to the placenta forcing it back into its place. Tamponage on the contrary forces the placenta away from its bed and tends to increase hemorrhage. The bag acts as a tampon, as a labor promoting element, and as a gentle dilating force.

Cervical tamponage is a makeshift method, only to be resorted to when the bags are not at hand. It is often ineffectual in controlling hemorrhage and of little use as a cervical dilator. The percentage of infection after packing is larger than after any other method. It is useful when the cervix is partially dilated and hemorrhage must be controlled until other measures are undertaken.

Antiseptic moist gauze should be used and it is well if the antiseptic is a styptic also.

The gauze may be left until the cervix is sufficiently softened and dilated to allow a bag to be inserted or bimanual version to be done. The packing is not effective unless the gauze is packed well within the

up against the placenta and the closed full of gauze also in order support and counter pressure should be moist as it then may more firmly and care should be to bruise the vaginal mucosa in dilatation. A vaginal speculum introduced with the patient upon in a good light. The cervix should and steadied with a bullet forceps have packed firmly. The patient put to bed and watched carefully bleeding or signs of concealed

a report of 154 cases treated methods, had the highest mor- cent., with tamponage and cent. of the children. The from bleeding and infection. methods do not show as good the one referred to. Bon- method of bimanual dilatation cervix and immediate delivery a higher mortality than the previous Boer. He has reported 171 cases treated this method with a mortality of 18 per The disadvantages of the method the amount of time required to dilate cervix, twenty minutes to one hour in assistant's hands, with constant loss of blood, the danger of laceration of the cervix, and the difficulty of completely dilat- the cervix so that the head may come through without traumatism.

Steel dilators after the type of Bossi's instrument are very dangerous and only of use to dilate the cervix sufficiently to allow version to be done or to insert a bag. A de Pilter bag may usually be inserted through cervix admitting two fingers, and to obtain this amount of dilatation the Goodell two- pronged dilator does as well as the more complicated and expensive instrument of Bossi.

Caesarean section, much vaunted of recent years by surgeons is not favored by obstetricians. Holmes' collection of Caesarean sections for placenta previa gave a maternal mortality of 21 per cent. and an ultimate fetal mortality of 62 per cent. Little encouragement here to advocate the operation. Jewett, in a later paper, collected 95 cases, not including Holmes' collection, with a maternal mortality of 11.5 per cent. and a direct fetal mortality of 34 per cent., the ultimate fetal mortality of children dying in the puerperium not being stated. The combined series give a maternal mortality in 125 cases of 13.6 per per cent.

The ease with which Caesarean section can be done defies operators into the belief that it is a simple operation and without mortality; but the facts remain that the mortality of all classes of Caesarean section is, in 3,000 collected cases, 7 per cent. How much greater will the dangers be in placenta previa where the patient, weakened by hemorrhage and contaminated by examinations, is unfit to stand such a radical surgical procedure. To treat these cases by Caesarean section is but to add another greater danger to that already existing.

The only excuse for a Caesarean section in any condition is to save a living child and, if there is a direct fetal mortality of at least 34 per cent. with a probable ultimate mortality one-fourth greater, a living child will hardly be obtained in as many cases as in the bag treatment and the safe method of version and delayed extraction will save more mothers. It is doubtful whether the 125 cases with 13.6 per cent. mortality represents the true estimate of mortality, as no large clinic statistics have yet been reported and, with isolated cases, it is human

nature to report successes and allow failures to be forgotten.

When Caesarean section is not done until the end of the period of dilatation, there is no security against a fatal after hemorrhage, for, by that time, the insertion of the placenta in the isthmus or cervix has already been stretched and, with defective contraction of this segment of the uterus, hemorrhage is likely to follow. The hemorrhage comes mainly from the lacerated vessels in the upper part of the cervix and, with a Caesarean wound in the uterus, this would be difficult to control by gauze packing or other means.

Vaginal Caesarean section has been advocated in placenta previa with an undilated cervix. Bumm was its most weighty advocate; but now he, Sigwart says, has abandoned the operation. The amount of hemorrhage is greater from a cut wound than from a torn one and, in these incisions of vaginal Caesarean operation, the bleeding is sometimes severe and difficult to control. If the placenta is situated posteriorly, it may be possible that anterior hysterotomy may be of value, but it is difficult to decide when this condition occurs. Also, if the placenta is posteriorly situated, the elastic bag may be passed around the anterior lobe.

Incisions into the cervix, when the os is not fully dilated are, however, occasionally of use, although they need not go so far as to include the surface of the uterus above the vaginal vaults.

In the treatment of the incomplete form, the mainstay of treatment is the elastic bag. Its advantages are that it can be easily inserted and it controls the hemorrhage. The placenta, not covering the os completely, does not obstruct its passage; the membranes are easily ruptured and the elastic bag may be inserted within the membrane, much reducing the mortality.

Version and breech extraction must be reserved for those cases of incomplete placenta previa in which the os is fully dilated with unruptured membranes or urgency of delivery is demanded. The greater possibility of obtaining a living child in incomplete placenta previa renders it expedient that all possible means should be taken to this end.

When the insertion of placenta is high in the uterus and the membranes present at the os, the hemorrhage may sometimes be controlled and labor hastened by rupture of the membranes. This gives the best chance of a live child.

The treatment by rupture of the membranes alone, however, should be confined to mild cases with a high insertion of the placenta. The main reliance in the treatment of incomplete placenta previa should be the large elastic bag, 10 to 12 cm. in diameter and with a capacity of 500 c. c. of water. Version and breech extraction should be reserved for those urgent cases with a fully dilated cervix and much bleeding.

The dangers of placenta previa by no means cease with delivery of the child, but in a large proportion of cases, hemorrhage occurs after labor. This bleeding does not as a rule occur immediately after delivery, because of the fall in blood pressure coincident with the birth of the child; but usually takes place within an hour. This delay of the hemorrhage makes it of a most insidious and dangerous character. A very large percentage of all deaths in placenta previa are due to this form of hemorrhage. In Hammer's series, three of eight deaths were from postpartum hemorrhage due to

atony of the uterus. In Warren's series of ninety-four cases, postpartum hemorrhage was present in 15 per cent. and, of six deaths in all, two were from this cause.

It is, therefore, necessary to take measures to prevent the occurrence of this hemorrhage. A dose of one of the good preparations of ergot should be given hypodermatically immediately after delivery of the child. It is better to use one of the physiologically tested preparations, for much of the ergot upon the market is inert. Pituitrin, an extract of the pituitary body, is very efficient in stimulating the uterus to contract and has been used with good success by Foges and Hofstatter in sixty-five cases of postpartum hemorrhage. The uterus contracts firmly and remains in that condition for some time. It promises to be useful in placenta previa.

The question of uterine packing with antiseptic gauze to prevent hemorrhage immediately after delivery is an important one. If a patient is in a hospital where she can be carefully and minutely watched, and if the uterus has contracted well, uterine packing may not be necessary; but if the woman is delivered in a house where the preparation for packing would involve some delay, or if the woman is weak from bleeding and can spare no more blood, uterine packing should be done as a prophylactic against hemorrhage.

In other words, the uterus should be packed with gauze to prevent hemorrhage, or preparations should be made so it can be done instantly in case hemorrhage should begin. After delivery in placenta previa, no patient should be left without constant medical supervision for several hours after delivery.

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CHAPTER XVII.

OVARIAN PREGNANCY, WITH REPORT OF A CASE.

Introduction.—The occurrence of ovarian pregnancy was first proven by Catherine von Tussenbroek who accidently discovered a case while making pathological examinations. She made her examination and report of a specimen handed her by Kouwer. This was the first complete demonstration of ovarian pregnancy in 1899. Since that time a number of cases have been reported and all that are well examined and undoubted are collected in a table in this paper. The first nineteen cases were collected in Norris' table in 1909, and nine cases have been added to that table including the one here reported. An example of the fact that if an operator is on the watch for this condition it is more likely to be found is that of 28 cases, two each are reported by Webster, Norris and Miscolitsh.

Diagnosis.—The requirements of an undoubted ovarian pregnancy are that (1) the tube on the affected side be intact, (2) the fetal sac occupy the position of the ovary,

(3) it must be connected to the uterus by the utero-ovarian ligament, (4) definite ovarian tissue must be found in the sac wall and at different places in the sac wall.

These conditions are required to distinguish ovarian pregnancy from advanced tubo-ovarian or abdominal pregnancy where the ovarian tissue is plastered and flattened over the sac wall and so incorporated in the sac wall as to be impossible to distinguish whether the pregnancy is ovarian or not.

It is very difficult to say whether certain advanced ectopic pregnancies are tubal or ovarian in their origin, and it is almost impossible to prove their original site. For this reason, in this series so collected, all advanced and dubious cases must be excluded.

For an exact diagnosis microscopic examination must show evidence of pregnancy within the ovary, i. e., chorionic villi must be found. The presence of decidual cells alone is not sufficient evidence of ovarian pregnancy; for decidual cells may be present in various places, such as the broad ligament over peritoneal surface in ectopic pregnancy. Also, it may be possible that the mere presence of decidual cells in the tube is not evidence that gestation has occurred there and not in the ovary, as it is possible that such cells may exist in the tube during an ovarian pregnancy. Decidual cells may sometimes be found in the uninvolved tube when a tubal pregnancy is in the opposite side, and again as may be seen from the discussion of bilateral tubal pregnancy, decidual cells sometimes exist in a tube containing blood when no other signs of tubal pregnancy exist. So that decidual cells in the tube are no evidence for or against the presence of an ovarian gestation.

The occurrence of hemorrhage from the ovary sometimes occurs without ovarian pregnancy and from ovarian hematoma. Hedley[1] has reported 18 such cases with free peritoneal blood, and has described the course and pathology of the condition. Savage[2] has divided hematomata of the ovary into two types: (1) hematoma of the Graffian follicle, (2) hematoma of the corpus luteum. In the first type, he found the wall of the hematoma was lined by a single layer of epithelium which he regarded as a membrana granulosa, lying on a basement membrane and external to these were the two layers of tissue which appeared to correspond to the theca interna and theca externa. The cells of the inner layer showed early lutein cell formation and there were ill-developed Graffian follicles near the cavity of the hematoma and some opening into it.

The second type—hematoma of the corpus luteum—had an outer cell of ovarian tissue which was for the most part congested; the inner part of the wall showed newly formed fibrous tissue, poor in cells, and near to the lining in between the longitudinal strands of this tissue, there were blood extravasations, many round cells and many large rounded or cuboidal cells containing yellow coarse granules. The nuclei of these cells were relatively small and, in many instances, seemed to be crowded towards the periphery of the cell. The cause of these hematomata is supposed to be abnormal congestion of the ovary with hemorrhage into immature follicles.

It has been suggested that it might be possible that ovarian pregnancy be a cause of some of these hematomas. This seemed

[1] Hedley.

[2] Smallwood Savage. *Brit. Gyn. Jour.*, xxi, 285.

possible because several cases, as von Tussenbroek's and Kelly and McIlroy's, were discovered accidentally in the routine examination of surgical specimens. However, search does not bear this out. Still the similarity of the picture at operation between ovarian hematoma and ovarian pregnancy, both causing hemorrhage, is very striking and requires careful examination to distinguish one from the other.

The clinical course of ovarian pregnancy has nothing to distinguish it from ectopic pregnancy generally. The rupture occurs in the same way; the shock and collapse may be as extreme and the hemorrhage is sometimes great. The condition is chiefly of interest because of its rarity.

Clinical Report—Mrs. L., age 36, para I. Small woman. Good previous history. Severe cystitis 5 years ago. Operated upon by Dr. Ellice McDonald for retroversion by internal round ligament operation. Operation was done four years ago. When seen complained of pain on left side. Menstruation has been absent for 37 days. Thought she was pregnant. Tenderness on right side on abdominal palpation. Tenderness on movement. Uterus contracted and firm, not enlarged. Cervix slightly patulous. No softening of cervix, no contractions of the uterus. Hegar's and McDonald's signs not found. Light colored, bad smelling discharge from cervix. Doughy mass was felt posteriorly and to the left slightly displacing the uterus. Diagnosis was made of ectopic pregnancy which was concurred in by Dr. H. M. Painter, who was called in consultation. Immediate operation, Dr. Painter assisting. Free bloody fluid was found in the pelvis and on the left side in the region of the ovary and attached to the ovarian ligament was found a thin walled cyst about the size of a large walnut from the interior of which was attached a stringy piece of dark reddish membrane (decidual remnant). This was fixed to the inner lining of the cyst way. This membrane has evidently before the rupture covered the interior of the cavity within the ovary. The capsule was very thin in parts, varying in thickness. One part was densely infiltrated with blood.

The tube was apparently normal and was removed with the ovarian mass. There was no trace of a fetus. Microscopic examination showed that the walls of the cyst were formed of ovarian tissue with several corpora lutea at various stages. Numerous Graffian follicles were found. Numerous chorionic villi could be seen, although in many sections obscured by fibrin and clots. In the walls of the capsule there were areas of hemorrhages in the stroma. There was a moderate round-celled infiltration in places. Pigmentation was present almost in all sections of the ovarian stroma. Here and there were groups of large pigmented cells with large nuclei. Here and there were budlike masses with densely staining multiform nuclei or protoplasmic cells with nuclei. The tube was normal. Diagnosis —ovarian pregnancy.

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CHAPTER XVIII.

THE UNSOLVED PROBLEM.

The duty of a physician is three fold; first to cure the sick, second to teach others to cure the sick, and third to study disease and find remedies to cure the sick. Each of these is necessary to the complete physician, and without them, he fails in some part. To cure the sick is admirable, to teach, "delightful task to rear the tender thought," is laudable; but to discover the processes of disease and its cure, approaches the highest kind of duty.

To heal the sick is the function of the physician and aids those whom he touches; but pupils, taught to heal, go forth like the apostles to carry the word to others. One man's knowledge imparted to others is multiplied in proportion to the numbers he teaches and the power he has of imparting his experience. Those he teaches depend, however, more upon the character of the man and his influence over them as an uplifting stimulus which spurs them to greater efforts and keeps their ideals exalted. The spoken word is forgotten, but the memory of the man remains. So, while it is important to teach medicine, it is more important to teach the methods of the study of medicine. A student's study does not cease, but should extend throughout his lifetime. Habits of accuracy of thought and methods of observation are the foundation upon which the physician may rear the superstructure of his life.

If he have not these, he will be spurious and not true coin, "a kind of semi-Solomon, half knowing everything from the cedar to the hyssop." And this alone is not sufficient; he must in addition be taught what has been known and where to find it. "Knowledge is of two kinds. We know a subject ourselves or we know where we can find information about it." No man can hope to achieve a working knowledge of medicine in four years; the span of life is all too short to grasp more than a moiety of it. The task is so great that we must waste no time on useless efforts and vain imaginings. "Naught but firmness gains the prize, naught but fullness makes us wise, buried deep, truth ever lies." We must demand that we be taught what has been done in the past and, of the past, what is truth and what is speculation. This lack of perspective in the study of medicine is a fault of teaching, often due to a desire of the teacher to appear an oracle and that all his words be taken as truth. The student magnifies authority and bows down before reputation. This is fatal to true perspective of the study of disease. When you know a thing, to hold that you know it; and when you don't know a thing, to allow that you do not know it; that is knowledge. "Mark not who said this or that, but mark the words spoken," said Thomas á Kempis. "I open the truth," said Confucius, "to help only those who want to help themselves. My teaching is a solid square, but I present only one corner of the subject—I expert you to find the other corners." This must be the teacher's true attitude.

If the improvement of understanding is for two ends; first, for our own increase of knowledge, secondly, to enable us to deliver and make out that knowledge to others, how much better is it that we should inves-

[illegible] and study and discover for ourselves and impart our results to others.

This is the supreme function of the physician.

If we can reach a new [illegible] a new [illegible] by our students how many more can we reach by the printed line and trained [illegible] read by all the world of earnest men [illegible] that "natural feeling of mankind [illegible] desire for knowledge." Every human being whose mind is not debauched will be willing to give all that he has to get knowledge. My profession, sworn idealists and practical altruists, is not worse than the [illegible] of mankind, and wishes for each [illegible] addition to the sum of medical experience [illegible] as a longing as that of Naaman for the healing waters of Pharfar and Abana, [illegible] of Damascus.

[illegible] to alleviate human suffering and prevent [illegible] human ills, must be our portion. To do [illegible] it is not sufficient to rest content with [illegible] field as we find it, but we must experiment and cultivate anew. "I will not follow where the path may lead," said Strode, "but I will go where is no path and I will leave a trail."

The scientific study of medical problems is part of the work of every practitioner. Science is not confined within the four walls of the laboratory, nor such a rare bird that it is never caught by the clinician. The great present day problems are those of practical application and not those of pure science. Every man should feel that his profession requires of him something more than its practice as a means of his livelihood; he has a debt to pay, to add to the sum of its knowledge.

Clinical research is the greatest of all medical blessings. "It is twice blessed. It blesseth him that gives and him that takes." It gives to the worker an intimate and exact knowledge of his subject which can be obtained in no other way, and it benefits untold numbers whose physicians are readers and learners all over the world. Diffused knowledge immortalizes itself. It is a task which is never done as each piece of research opens to the scientific imagination more fields to work in and more problems to solve. The reward of duty is the power to fulfill another, and each clinical problem constitutes a pledge of duty to which every physician is bound to consecrate his every faculty to its fulfilment. By this, we may best fulfil the precept of the Great Physician, "Go ye to all the world, to every people * * *."

In return, the research worker will gain in knowledge, in power, an unending interest and unfailing occupation. It does not require that vast and grand discoveries should be made. They seldom are except by men who have served their apprenticeship in the day of small things, and so had training in the discipline of study and accuracy of observation. If each adds his stone to the arch, what matters who lays the keystone. The plaudits may be his: but he knows and the privates in the army of research know what contributions have gone before to make his victory possible. "Knowledge is the hill where few may climb; duty is the path where all may tread."

All physicians owe this duty—to contribute their quota, however small, to the sum of medical knowledge. It should, however, be approached in a true spirit of unselfishness, the spirit of disinterested curiosity which is the real flower of intellectual life. How else can he weigh and judge the facts and observe truly unless the motive of self-interest is put aside? Intellectual honesty is the true test to separate work that has

distinction from work that has it not.

In gynecology and obstetrics, the problems which remain unsolved are many. The early gynecologists were the forerunners in abdominal surgery, and the names of McDowell, Emmett, Sims, James Simpson and Lawson Tait should be engraved upon the minds of all surgeons. However, surgery has now come into its own in research, and there remain for the student of diseases of women many problems which have to do with disordered function rather than the surgical correction of tumors, growths and obstetrical trauma. Among these subjects are sterility and its causes, the menstruation and menstrual disorders, the relation of the glands of internal secretion, particularly the ovary, to the health of women, and many other so-called medical subjects. One great problem is that of the hypoplastic woman with her many and varied evidences of abnormality. This *asthenia congenitalis,* congenital hypoplasia, or whatever name the symptom-complex may be given, is more or less a biological problem, inasmuch as it has to do with the relation of an abnormal or aberrant type of woman as an animal to the normal or common.

In obstetrics, the field is still virgin. Bacteriology has had its miracles and surgery its victories, but obstetrics leads impotent and snail paced beggary. The four great complications in pregnancy, contracted pelvis, placenta previa, toxemia of pregnancy and eclampsia, and puerperal infection are still unsolved, and their treatment still disputed and obscure.

Of these problems, the greatest is puerperal infection. Puerperal infection is no less prevalent in private practice than it was before the days of antiseptic methods. In hospital practice, the mortality is very much reduced, yet there is record of hospital epidemics even in these latter years. To estimate the prevalence of this condition is difficult because in mortality statistics women dying from puerperal infection are frequently recorded under the disease of the organ which the infection attacks; for example, as peritonitis, from salpingitis, septic pneumonia, and other terminal expressions of infection. Puerperal infection is considered by the laity to be due to lack of care upon the part of the doctor, and for this reason, physicians dislike to register a possible criticism against themselves. So the mortality statistics in regard to death from puerperal infection are very inaccurate, and much under the actual rate of occurrence. Prof. Leopold, in 1907, stated that in Prussia 4,339 and in the German Empire 6,000 deaths occurred from puerperal infection in the previous year. Boche in an investigation extending over sixty years, and involving 363,624 deaths, stated that in Prussia 6,060 women died each year from puerperal infection, and that, in 1907, there were 6,000 deaths, showing no decrease in the mortality. There has been no improvement in the maternal mortality, except in hospital clinics for the last twenty years. Cullingworth from a study of the Registrar-General's statistics for 1897 said that there had been no decrease between the years of 1843 and 1897; he said "Puerperal fever continues to prevail as though Pasteur and Lister had never lived. There is needed a strong voice to rouse us from our lethargy and to plead with desperate earnestness for the lives that are still being unnecessarily sacrificed."

In the mortality statistics of the U. S. census of 1910, 3,892 deaths from puerperal infection are recorded in the registration area, which comprises three-fifths of the total population of the United States. On

...ere would have been from the ...population 5,485 deaths from puer... ...section registered each year from ... of the United States. This num... ...deaths is probably much under... ...on account of the difficulty of ... accurate registration on death ... It is unreasonable to suppose ... much greater population, and ... of physicians with less exact ... than there should be a smaller mor... ...puerperal infection than there ... Germany. It is probable that the ...y from puerperal infection through... ...United States is not less than ...women annually. This is based on ...vital statistics, and upon the probable ...of deaths from puerperal infection to ...total number of births. In the City of ...York for the year 1910 the total num... ...of births was 129,080, and the deaths ...istered as caused by puerperal infection ...225, a mortality of .02 per cent. *This ...rtality is about eighteen times less than ...mortality of an obstetrical hospital in ...same city and less than the best clinic ...port that could be found anywhere in the ...orld.* So the registration is obviously ...ery much under-estimated and hopelessly ...reliable. It is probable, basing the esti... ...upon the reports of other cities and ...port the proportion of puerperal infection ...the total number of births in other places ...ed in clinics that more than 700 women ...ie annually in New York from puerperal ...fection. An example of the inaccuracy ...f the registration is that Berlin, a clean ...ity with well trained physicians and exact ...egistration returns, has a mortality rate ...er 100,000 population of 35.1 for puer... ...eral infection. In New York, on the con... ...rary, the mortality rate for 100,000 popu... lation is 7.3. This shows the inconsistencies of registration.

Thus it may be seen that puerperal infection in spite of the advances in technic has not yet disappeared, and is still worthy of study.

The total deaths from cancer for the year 1910 amounted to 41,000 and the average age at death was 59.2 years; amongst the cases of puerperal infection the average age at death was 27 years. Puerperal infection thus takes its dreadful toll amongst women in their early married life when the great part of their usefulness in the family and in the world is still before them. They die to leave small children and sorrowing husbands. The economic loss to the United States of such young and useful beings is in itself no small one. In cancer, on the other hand, death occurs amongst those who have exceeded the probable duration of life by twenty years, and who are getting toward the end of their usefulness in the world. The prolonged suffering and the fact that the person afflicted is usually of an age when the patient has children, a position in the world, and a hold upon the affections of those around him, make cancer a disease for which it is easy to obtain research workers and money to support them. At the present time the public eye is occupied by the neo-alchemists with their philosopher's stone. The problem of puerperal infection is different. Here women die quickly, silently slip out of the world, and their memory is marked only upon the hearts of their young children and bereaved relatives. Yet a woman dead from puerperal infection is just as dead as one from cancer, but I have not yet seen any laboratory erected for the study of puerperal infection, or any money left as

a foundation for its investigation.

The possibility of solving the problem of puerperal infection is infinitely greater than that of cancer. The causes of puerperal infection are known, and prevention is but a problem of the application of proper methods and a more thorough knowledge of the processes of the infection. Amongst obstetricians at the present time the most popular treatment of puerperal infection is a *laisser faire,* do-nothing policy. They claim that more women with puerperal infection get well if they are left alone than with any known method of treatment. This does not mean that their opinion is correct, but that most known methods of treatment are ineffectual or harmful. There is no more reason why the processes of infection through the uterus should go untreated than that infection elsewhere in the body should be left to itself.

The problem of puerperal infection is however, essentially one of prevention. The three avenues from which infection may occur consist, first, of the obstetrician and his instruments, second, of the vulva and outward genitalia, and third, of the vagina. If all these can be made to harbor no infectious organisms, the probability of puerperal infection would be very slight.

The surgeon's hands and the instruments may be sterilized so that there is little danger of infection there. The vagina, as a rule, before labor, contains few, if any, pathogenic organisms, but the vulva and outward genitalia almost constantly harbor pathogenic organisms of varying degrees of virulence. In the puerperium, streptococci, as well as other bacteria may pass up from the vulva into the vagina, and on the third day of the puerperium the vaginal lochia of about half of all the cases of childbirth contains pathogenic organisms. It is obvious, therefore, that the elimination of puerperal infection must depend to a large extent upon antiseptic methods and preventive measures.

In the consideration of what antiseptic measures may be taken it is possible that return may be made to the antipartum douche. The vaginal secretions have always been said to have some bactericidal power because, if bacteria are inserted into the vagina, they usually cannot be recovered after some days. It is probable, however, that the bactericidal properties of the vaginal secretions are small or almost nil, and that the disappearance of the bacteria is due to the drainage and to the fact that, in the absence of trauma, bacteria will disappear from almost any epithelial surface. This is well shown by the introduction of bacterial cultures into the bladder, which cause no danger unless traumatic conditions are present.

Heretofore, experiments in regard to antipartum douches have usually been done with bichloride of mercury and formalin. Formalin is a very weak bactericide having about one-third the strength of phenol, and is inert in the presence of albuminoid substances, such as mucous membrane and vaginal secretions. Bichloride of mercury is also rendered inert, inefficient and useless in the presence of organic matter, as soap, pus, mucous membrane and vaginal secretions. As a result, neither of these so-called germicides have any effect upon the vaginal flora, and only act as irritants to the mucous membrane. Bichloride of mercury, in addition, on account of poisonous action, is a dangerous germicide to use at labor when the huge raw surface of the uterus is capable of absorption, and numbers of deaths have been reported after its

use. The ideal obstetrical germicide should be unirritating, not poisonous, and efficient as a germicide in the presence of organic matter.

Burckhardt and Kolb (*Zeit. f. Geburt. u. Gyn.* 1911-LXVIII-1) made a study of seven hundred women, half of whom received douches. Excluding all pathological Labors, it was found that, amongst the douched patients, there was a morbidity of 6.5%, and, amongst the non-douched patients, there was a morbidity of 8.6%. They used a solution of chlor-m-kresol, one to four hundred, with a bactericidal power several times stronger than phenol, and possessing none of the destructive powers which bichloride of mercury exerts upon the epithelium. They conclude that the post-partum douche retarded bacterial growth for several days. The patient received no germicidal treatment after the first day. It is possible that, when the vulvar parts are washed each day with a similar non-irritating germicidal solution, that the organisms might be absent for a longer period. This study is of great interest from the point of view of the preventive treatment for puerperal infection.

There are at present many other new germicides, which are efficient in the vagina and considerably more germicidal than chlor-meta-kresol. The investigation of this aspect of the problem in a large clinic would be of great interest.

It is important that no dangerously poisonous germicide should be used in the preventive or other treatment of puerperal infection.

The preparations of cresylic acid are popular obstetrical germicides. Witthaus and Becker, *Medical Jurisprudence*, 1911, Vol. 4, P. 1187) has collected 3 cases of poisoning from one of the most popular of these preparations, of which 11 cases followed irrigation of the uterus. Other cresylic acid preparations, including liquor cresolis compositus of the U. S. P. have similar dangers. The essential, after efficiency in an obstetrical germicide, should be its non-poisonous character as it must often be introduced into the vagina after labor or in the puerperium when there is great possiblity of absorption from the large raw surface of the uterus. The development of an unirritating non-poisonous germicide, efficient in the presence of organic matter, would be of itself a great contribution to the prevention of puerperal infection.

The processes of infection in puerperal fever have not received intelligent study. By this is not meant that time and labor have not been expended, but that puerperal infection has been thought to be a disease apart and not to follow the ordinary course of infection as does lymphangitis of the arm, erysipelas or peritonitis. It is true that the infection is much modified by the softened and vascular pelvic organs undergoing as they do a sort of degeneration of involution. In addition, the large lymphatic and vascular supply of the pelvis with its adjacent large vessels and the lessened resistance of the pregnant woman do seriously alter the course of the infection. Still the processes of inflammation and infection are fundamentally alike and a great deal of our lack of knowledge is due to the fact that autopsies are not often obtained and, when obtained, the pathological findings are usually not properly studied. This is because pathologists are seldom familiar with conditions of pregnancy as they come but rarely in their routine autopsy work and, more's the pity, there are few pathologist-obstetricians.

The bacteriology in spite of the large amount of study which has been given it, is not yet settled. The role of the gonococcus in puerperal infection has not been determined. Stone, Mayer, Gurd and myself have shown with pitifully incomplete studies that a very large number of cases of puerperal fever are due to this organism. I have reported in this series a case of death with pure culture of gonococcus, and Gurd has reported a series of bacteriologically studied cases where the type of infection from the gonococcus was severe and the fever high. One case died. The lack of success of previous investigators in the cultivation of this organism has been due, as is well shown by Gurd (*Amer. Journ. Med. Sci.*, 1908, Dec. 9, and *Jour. Med. Research*, 1908, XVIII, 291) to improper media and to the fact that the cultures were taken by aspiration through a tube. This gave feeble or dead organisms and, when the culture was taken by swabbing the surface of the endometrium, discovery and growth of the organism was more frequent. The difficulty of cultivation of this organism is well known and Gurd has obtained good results with blood agar media of a titer of .5 phenolphthalein (hot titration).

Media for the cultivation of the gonococcus as well as for anerobic and hemolytic organisms should be in the armamentarium of every investigator into the bacteriology of puerperal infection. It is possible that the gonococcus may be found to be one of the fertile causes of puerperal infection, and that the difficulty of cultivation and recognition will explain the fact that puerperal fever is still so prevalent in spite of our present methods. Gonococcus puerperal infection after recovery from the initial attack remains as a chronic pelvic inflammation, in this way differing from most other infecting organisms. The late crippling effect of gonococcus puerperal infection renders it a more serious condition than is commonly recognized and make its prevention a necessity.

The knowledge of the prognosis of puerperal infection is almost unknown. All we know is that puerperal infection is a self-limited disease, like erysipelas, and tends to a spontaneous cure. The influence of exhaustion has been shown by Williams (*Bos. Med. Surg. Jour.*, Sept. 22, 1910) and Wirz (*Hegars Beitrage z. Geb. u. Gyn.*, 1909) to be a great factor. Puerperal morbidity, with the exception of mastitis, is increased in direct proportion to the duration of labor and the morbidity after low forceps was less than that after spontaneous labor, presumably because labor was shortened and exhaustion lessened.

A persistently high pulse rate, even with relatively slight fever, is serious ground for alarm especially when the temperature subsides as the pulse rate increases. Jaschke (*Zeit. f. Geb. u. Gyn.*, 1910, LXVI, 2) states that the paralysis of the splanchnic vessels is the index of the severity of the disease, while it is the main source of danger. The blood pressure and the second aortic sound show the condition of the vessels and the possible compensatory power of the heart. In cases where the blood pressure does not decline or the decline is followed by return to normal, the prognosis is good. A discordance between the pulse rate and temperature is a serious indication.

Delirium is a rare symptom and one of utmost gravity. Instead of being anxious and disturbed, the patient may present an exaggerated feeling of well-being and express a desire to undertake her usual occupations. In 56 cases with delirium, 39 ended fatally. Its occurrence between the

d and eighth day of such illness is a gnostic symptom of the utmost gravity. e prognosis as well as all other parts of problem offer a great field for investiga-n.

The serum or vaccine treatment of puer-al infection offers but little hope of cure. s to be remembered, in streptococcus in-tion, the small amount of toxin devel-ed and the absence of bactericidal prop-ies in the blood makes it probable that relief from this form of infection comes ough leukocytosis and not through the mation of antibodies. In animals ated with streptococci, phagocytosis is important factor in the production of munity and the serum exhibits neither ctericidal activity with respect to micro-ganisms nor antitoxic effect with respect the action of filtrates of cultures.

From the evidence, both clinical and ex-rimental, it may be concluded that anti-eptococcus sera and vaccines as at pres-t prepared have but slight protective d curative value. It is to be remembered at puerperal infection is a self-limited dis-se which tends to a spontaneous cure, e erysipelas, and the limitation of the fection is often ascribed to the serum or ccine when it would have occurred in any se. Erdman (*J. A. M. A.*, 1913, Dec. 6) s shown in the analysis of 800 cases of rysipelas that this form of streptococcus fection was not benefitted, but the recov-y delayed and the morbidity increased by ra, vaccines and filtrates of cultures.

The use of vaccines in puerperal fever s little or no scientific foundation. In e words of Theobald Smith (*J. A. M. A.*, 13, May 24) "The medical profession ould see to it that vaccine therapy does t degenerate into inconsiderate and reck-s experiments upon human beings, that it does not create false hopes in hosts of patients and that it does not originate and end in commercialism and the desire to exploit the weak and unfortunate."

Streptococcus infection, however, only causes rather more than half of the cases of puerperal infection and its study should include that of other organisms. The staphylococcus is a frequently found organism and, contrary to the usual belief, is responsible for many cases of puerperal endocarditis. Infection with this organism is not less severe in type than that from the streptococcus, as is shown by Basso (*Ginecologia*, Ap. 30, 1908), who collected a large number of cases with a mortality of 80 per cent. In fact, one of the striking phenomena of puerperal infection is the increase in severity which organisms of comparatively small virulence, such as the gonococcus and colon, may acquire and the severe systemic symptoms and danger to life they may cause. This may be due in part to the lessening of resistance to infection which occurs in the pregnant.

The whole tendency of research in the treatment of infection is toward chemotherapy as Ehrlich said in his address before the British Medical Association. The question of treatment in puerperal infection is unsettled and will remain so until the ideal obstetrical germicide is discovered. Those heretofore used, such as bichloride of mercury and formalin, are inefficient because they are neutralized by the albuminoids of the body tissues or discharges: others, such as phenol and the cresylic acid preparations, are too poisonous for free use. The idea that a germicide must be toxic if it is effective against microorganisms is a mistaken one; otherwise chemical substances would be effective in proportion to their toxicity, which is not so.

Nor does it explain the fact that the same substance, cresol, for instance, may be three times more germicidal in emulsion than in solution, although the toxicity may be the same. The ideal obstetrical germicide, non-toxic, efficient in the presence of albuminoids and unirritating, is not too much to hope for and when it is discovered, it will aid very decidedly in the prevention and cure of puerperal infection.

The use of intra-uterine douches, for example, would be put upon a new basis if such a germicide were available to replace such irritating substances as bichloride of mercury, formalin and the cresylic acid preparations. *Primo non nocere* is the good old fashioned rule of a wise and skeptical profession and, with this condition fulfilled, it might be possible to do many things in puerperal infection which at present are forbidden.

But the work of investigation should be taken up by the larger clinics. The establishment of research foundations for the study of puerperal infection would produce more immediate results and greater benefits to humanity than all the cancer research that has been done. In spite of the vast amount of work that has been done on cancer, the hope of a cure is no nearer, and, except for the fact that it has been proved possible to immunize mice to transmissible mouse cancer, the research has made but little progress. Had a tithe of the effort been applied to puerperal infection, it is probable that this plague would be conquered and the wail of the motherless children would be banished from the land. I would that these little voices in lamentation might ring in the ears of every obstetrician and pathologist until each is driven to contribute all his energies and all his efforts to the salvation of the thousands of mothers needlessly sacrificed.

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